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Author: Billie L. Turner
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REVISION OF THE GENUS *Orbexilum* (Fabaceae: Psoraleeae)

Billie L. Turner  
Plant Resources Center, 1 University Station F0404, The University of Texas, Austin, Texas 78712-0471

**Abstract:** *Orbexilum* Raf. is a wholly North American genus confined to the southeastern U.S.A. and Mexico. Grimes provided a revision of the complex in which eight species were recognized. Turner added two additional species, *O. chiapasanum* and *O. oliganthum*, these subsumed under the fabric of *O. melanocarpum* by Grimes. The latter worker also recognized a var. *gracile* of the widespread *O. pedunculatum* that in the present account I treat as a species, *Orbexilum gracile*. This brings to 11, the number of species currently recognized for the genus. Detailed descriptions and a key to the taxa are provided, along with maps showing their distributions.

**Keywords:** *Orbexilum*, *Psoralea*, Fabaceae, Mexico, North America.

The present revision is occasioned by my upcoming treatment of *Orbexilum* for the *Flora of North America*. In particular, I wished to show dot-maps, by county, for the species of the U.S.A., this not provided for by current treatments of the *Flora*. In the process, I thought it also reasonable to bring the taxonomy up to date.

As treated by Grimes (1990), *Orbexilum* is a genus of eight closely related species confined to North America, this largely confirmed by DNA data (Egan and Crandall, 2008). Turner (2007) proposed two additional species for the genus, *O. chiapasanum* and *O. oliganthum*, both part of *O. melanocarpum*, sensu Grimes. In the account that follows I have also elevated *O. pedunculatum* var. *gracile* to specific rank, bringing to 11 the number of species recognized for the genus. Since a complete synonymy for all of the taxa is provided by Grimes (1990), I have accounted only for those names pertinent to the present study.


**Perennials** or sprawling subshrubs to 2 m high. **Stems** stiffly erect to ascending, arising from slender lignescent rhizomes or fusiform taproots. **Stipules** linear-lanceolate to somewhat foliolate, peristent or soon deciduous. **Leaves** unifoliate to palmately or pinnately 3–7 foliolate; leaflets lanceolate to ovate or oval, variously pubescent to glandular-punctate, or glabrous. **Inflorescence** spicate, bracteate, markedly pedunculate. Flowers short-pedunculate, the petals violet to purple. **Calyx** tubular-campanulate, the tube 2–3 mm long, the teeth 2–3 times as long as the tube. **Corollas** with well-developed banner, wings and keel, the latter fused apically. **Stamens** mostly fused, the dorsal one less so; anthers introrse, in two series, those of the upper series basifixed, those of the lower series dorsifixed. **Fruits** elliptic to ovate, dark brown to black, rugose or papillose, glandular to glabrous, deciduous above the receptacle. **Seeds** reniform, 3–6 mm long. **Base Chromosome Number:** \(x = 11\).

Diagnosis of *Orbexilum*. Along with most other North American genera characterized by Grimes (1990), *Orbexilum* is resolved as monophyletic in a combined phylogenetic analysis of nuclear and chloroplast loci of the tribe Psoraleeae (Egan and Crandall, 2008). *Orbexilum* is readily distinguished among the genera of Psoraleeae by its thick glabrous pod walls that are distinctively rugose and by its calyx that is scarcely accrescent,
KEY TO THE SPECIES

1. Leaves unfoliolate .......................... 11. *O. virgatum*
1. Leaves 3–7 foliolate.

2. Leaves pinnately 3-foliolate.

3. Leaflets cordate at base .......................... 4. *O. macrophyllum*
3. Leaflets not cordate at base.

4. Plants eglandular throughout; stipules subfoliaceous, 1.0–1.3 mm long .......................... 10. *O. stipulatum*
4. Plants to some extent glandular, at least on the upper leaflets; stipules lanceolate to linear, to 1 cm long.

5. Fruit papillose .................................. 7. *O. onobrychis*
5. Fruit glabrous or glandular, never papillose.

6. Flowers 5–7 mm long.

7. Bracts, calyces and fruits eglandular, or nearly so; bracts narrowly ovate, 5–8 mm long, 1.0–2.5 mm wide; Atlantic Coastal Plain .......................... 2. *O. gracile*
7. Bracts, calyces and fruits markedly glandular; bracts broadly ovate, 6–10 mm long, 2–5 mm wide; south-central U.S.A. .......................... 8. *O. pedunculatum*

6. Flowers 8–12 mm long.

8. Leaflets ovate, widest at or near the middle; south-central U.S.A. .......................... 9. *O. simplex*
8. Leaflets ovate, widest well below the middle; Mexico.

9. Fruits ca 6 mm long; seeds ca 3 mm long; Chiapas, Mexico .......................... 1. *O. chiapasanum*
9. Fruits ca 10 mm long; seeds ca 6 mm long; northern Mexico.

10. Plants upright, 10–20 cm high; leaflets mostly 2.9 cm long or less; montane habitats 2000–2500 m; Coahuila, Nuevo Leon, n Zacatecas .......................... 6. *O. oliganthum*
10. Plants sprawling herbs 30–80 cm high; leaflets mostly 3 cm long or more; submontane habitats, 1000–1900 m; Coahuila, Nuevo Leon, Tamaulipas, Queretaro, and Hidalgo .......................... 5. *O. melanocarpum*

1. Orbexilum chiapasanum B.L. Turner, Phytologia 89: 70. 2007. Fig. 1

Perennial sprawling herbs or subshubs to 2 m tall. Stems erect, upwardly appressed-pubescent, arising from slender rhizomes. Leaves pinnately trifoliolate; petioles mostly 2–4 cm long; leaflets ovate to lanceolate, 3–5 cm long, 1.5–3.0 cm wide. Inflorescence a columnar spike 3–5 cm long; peduncles 6–12 cm long. Calyx 6–7 mm long, glandular-punctate. Flowers mostly 7–9 mm long, purple to violet-purple; banner ovate, 4–5 mm long, 3–4 mm wide; wing petals 5–7 mm long; keel petals 4–6 mm long. Fruit ovoid, ca 6 mm long, 4 mm wide; seeds ca 3.5 mm long, 2.0 mm wide. Chromosome number: unreported.

Flowering: Mar–Nov; eastern Chiapas, in mostly pine-oak woodlands of montane rain forests, 1000–1800 m.

Grimes (1900) included this taxon within his concept of *Orbexilum melanocarpum*. As noted by Turner (2007), however, the two taxa are readily distinguished by habit, fruits, seeds and geography.

2. Orbexilum gracile (Torr. & A. Gray) B.L. Turner, stat. nov. Fig. 2


*Orbexilum pedunculatum* var. *gracile* (Torr. & A. Gray) Grimes

Characters given in the above key, expanded upon by Wilbur (1963), and otherwise very similar to *O. pedunculatum*, as noted in more detail under the latter.

Chromosome number: unreported.

Flowering: May-Jun; Atlantic Coastal Plain from Virginia south to northeastern Florida, mostly along railroads and highways in sandy pine-flats.

Isely (1998, Map 307) shows *Orbexilum pedunculatum* as occurring in eastern Virginia. I recognize such collections as but aberrant forms of *O. gracile*, as presumably did Wilbur (1963).
3. **Orbexilum lupinellus** (Michx.) Isely, Sida 11: 432. 1986. Fig. 3

*Psoralea lupinellus* Michx., Fl. bor.-amer. 2: 58. 1803.

**Perennial herbs** to 0.75 m high. **Stems** slender, glabrous, arising from elongate slender ligneous tap roots or slender rhizomes. **Leaves** mostly palmately 7-foliolate; petioles 1–4 cm long; blades linear, glabrous or nearly so, glandular, 2–7 cm long, 0.5–3.5 mm wide. **Inflorescence** an elliptic spike 1–6 cm long; peduncles 3–10 cm long. **Calyx** 2–3 mm long, glabrous to sparingly pubescent, glandular. **Flowers** mostly 5–7 mm long; petals purplish-blue; banner rounded, 4–5 mm long, ca 3.5 mm wide; wing petals 5–6 mm long; keel petals 3.5–4.5 mm long. **Fruit** 9–11 mm long, 5–6 mm wide, rugose, glabrous, glandular; seeds reniform, 5–7 mm long.

**Chromosome number**: unreported.

**Flowering**: May-Aug; mostly in pine-oak forests in sandy soils, North Carolina to Florida.

Isely (1998) noted that “this feathery-foliaged *Orbexilum*” has been treated as a monotypic genus (*Rhytidome*) by both Rydberg (1928) and Small (1933), but both Isely (1998) and Grimes (1990) included the taxon in *Orbexilum*.

4. **Orbexilum macrophyllum** (Rowlee) Rydb., N. Amer. Fl. 24: 5. 1919. Fig. 4


**Perennial herbs** to 1 m (?) tall. **Stems** retrorsely pubescent with fine hairs, the roots unknown. **Leaves** pinnately trifoliolate; petioles 3–9 cm long; blades broadly ovate, cordate at base, 6–7 cm long, 5.2–6.3 mm wide. **Inflorescence** columnar, 10 cm long or more; peduncles 11–15 cm
long. CALYX 7–8 mm long, eglandular, villous. FLOWERS ca 9 mm long, color unknown; banner ovate, ca 8 mm long, 7 mm wide; wing petals ca 9 mm long; keel petals ca 7.5 mm long. FRUIT unknown.

CHROMOSOME NUMBER: unreported.
FLOWERING: Jun; according to Isely (1990) “This distinctive species was collected in 1897 at ‘White Oaks’ in Polk County, North Carolina, which has been interpreted as Tryon Mountain. It has not been seen again despite repeated searching.” The species is presumably extinct.

5. **ORBEXILUM MELANOCARPUM** (Benth.) Rydb., N. Amer. Fl. 24: 6. 1919. Fig. 1

PERENNIAL SPARSELY BRANCHED HERBS 30–80 cm tall. STEMS relatively few arising from slender rhizomes, pubescent with upwardly-appressed hairs. LEAVES pinnately trifoliolate; petioles mostly 3–5 cm long; leaflets ovate, 3–5 cm long, 2–3 cm wide, sparingly appressed-pubescent and glandular-punctate above and below. INFLORESCENCE columnar, mostly 3–6 cm long; peduncles 5–10 cm long. CALYX 7–10 mm long, sparingly pubescent and markedly glandular-punctate. FLOWERS 8–9 mm long; corollas dark violet to purple; wing petals 7–9 mm long; keel petals 5–7 mm long. FRUITS ovoid, 9–10 mm long, rugose, glandular-punctate, often with a few tubercles; seeds 5–7 mm long, 2–4 mm wide.

CHROMOSOME NUMBER: unreported.
FLOWERING: May-Aug, mostly oak forests below 1000 m, in calcareous soils, Coahuila, Nuevo León, Tamaulipas, Querétero, and Hidalgo.

Grimes (1990) included *Orbexilum oliganthum* and *O. chiapasanum* under the rubric of this species; I consider the two taxa to be worthy of specific rank (Turner, 2007).

6. **ORBEXILUM OLIGANTHUM** (Brandegee) B.L. Turner, Phytologia 89: 71. 2007. Fig. 5

PERENNIAL, OFTEN DECUMBENT, HERBS 10–20 cm tall. STEMS mostly numerous, arising from slender rhizomes, pubescent with upwardly-appressed hairs. LEAVES pinnately trifoliolate; petioles mostly 2–4 cm long; leaflets ovate, 1.5–3.0 cm long, 0.5–1.5 cm wide, sparingly appressed-pubescent and glandular-punctate above and below. INFLORESCENCE more or less capitate or ovoid, mostly 2–3 cm long; peduncles 5–10 cm long. CALYX 5–7 mm long, sparingly pubescent and markedly glandular-punctate. FLOWERS 8–9 mm long; corollas dark violet to purple; wing petals 7–9 mm long; keel petals 5–7 mm long. FRUITS ovoid, 9–
10 mm long, rugose, glandular-punctate, often a few tubercules; seeds 4–5 mm long, 2–3 mm wide.

CHROMOSOME NUMBER: unreported.

FLOWERING: May-Jun; pine-oak woodlands at higher elevations of the Sierras, mostly 1000–2400 m, calcareous or gypsum soils, s Coahuila, Nuevo León, and ne Zacatecas.

Grimes (1990) included this taxon within his broad concept of Orbexilum melanocarpum, as noted by Turner (2007). The type of O. oliganthum is from the higher elevations of the Sierra Parras, Coahuila, and appears worthy of specific rank, although Grimes thought the characters that separated the two population-systems too variable to justify such recognition. I find that the two taxa differ consistently in habit, leaf size, and calyx features, the latter commented upon by Grimes.

7. ORBEXILUM ONOBRYCHIS (Nutt.) Rydb., N. Amer. Fl. 24: 5. 1919. Fig. 6

Psoralea onobrychis Nutt., Gen. N. Amer. pl. 2: 104. 1818.

PERENNIAL HERBS to 1 m tall. STEMS mostly single and stiffly erect, pubescent at first but soon glabrate, arising from ligneous rhizomes. LEAVES pinnately trifoliolate; petioles 2–9 cm long; blades lanceolate to elliptic-lanceolate, 4–12 cm long, 1.5–5.0 cm wide, sparingly pubescent above and below. INFLORESCENCE an elongate spike 3–20 cm long; peduncles 5–15 cm long. CALYX 2–3 mm long, puberulent, 10-veined. FLOWERS 5.0–6.5 mm long; petals violet to purple; banner ovate, 5–7 mm long, 4–5 mm wide; wing petals 5.5–6.5 mm long; keel petals 3–4 mm long. FRUIT obovate, 8–12 mm long, 5.0–5.5 mm wide; seeds reniform, 4–6 mm long.

CHROMOSOME NUMBER: unreported.

FLOWERING: May-Jun; northeastern plains of the U.S.A. from Iowa to Ohio, southwards to Tennessee, mostly along roadsides and in dry open woods and fallow pastures.

8. ORBEXILUM PEDUNCULATUM (Mill.) Rydb., N. Amer. Fl. 234: 7. 1919. Fig. 7


PERENNIAL HERBS to 80 cm tall. STEMS 1–8, stiffly erect or ascending, sparingly strigose to glabrate, arising near ground level from ligneous, often tuberous, taproots or slender rhizomes. LEAVES pinnately trifoliolate; petioles 0.2–5.0 cm long; leaflets lanceolate to elliptic, 2–7 cm long, 0.6–2.2 cm wide. INFLORESCENCE columnar, 2–13 cm long; peduncles 4–16 cm long. CALYX 4–7 mm long, sparingly pubescent, glabrous or not. FLOWERS 5–7 mm long; petals violet to purple; banner ovate, 5–7 mm long, 4–5 mm wide; wing petals 5.5–6.5 mm long; keel petals 3–4 mm long. FRUIT obovate, 3–5 mm long, 3–4 mm wide, rugose, glabrous or somewhat glandular; seeds round-ovate, 3.0–3.5 mm long, 2.0–2.5 mm wide.

CHROMOSOME NUMBER: 2n = 22.

FLOWERING: May-Jul; open woods and grasslands throughout most of the eastern U.S.A.

Orbexilum pedunculatum is allopatric with its closest relative, O. gracile, but the
two taxa show little evidence of intergradation in regions of near contact (as noted by Isely 1990), hence their recognition as distinct species. This was also commented upon by Grimes (1990), “The varieties are usually easily distinguished; I have seen very few intermediate specimens.” He goes on to add, “Along with the glandularity, there are some quantitative differences between the two, differences subject to too much overlap and exception to be diagnostic.” Which seems to be the case, the best characters by which to distinguish the two are given in the above key.

Isely (1998) also commented upon the relationship of the two taxa, as follows:

“… the eastern Coastal Plain form [var. gracile], is usually glandular on all plant parts, conspicuously so on bracts, and the undersides of leaflets. Var. pedunculatum, lacking such glands or nearly so, is widely distributed from Texas and Oklahoma east into the Appalachians.” He further noted that “Varietal segregation is not entirely ‘air-tight’; there are some intermediacy in the mountains and a few weakly glandular forms may be encountered farther west. But most material is clearly one or the other and it seems worthwhile to retain this now traditional varietal bifurcation despite, perhaps, its rather trivial nature.”

Perhaps the most perceptive comments on the relationship of Orbexilum pedunculatum to O. gracile have been those of Wilbur (1963). He provided an excellent key for their recognition and noted that the two taxa “seem most distinct within North Carolina and also throughout their ranges.” Such is also reflected in his distribution maps for the North Carolina species, almost exactly as I have discerned (independently) the taxa concerned.

9. Orbexilum simplex (Nutt. ex Torr. & A. Gray) Rydb., N. Amer. Fl. 24: 6. 1919. Fig. 8
Perennial herbs to 75 cm tall. Stems appressed-pubescent, glabrate with age, only 1 or rarely 2 arising from fusiform taproots. Leaves highly variable, either simple, palmately 5–7 foliolate, or more often pinnately trifoliolate; petioles mostly 0.5–7.0 cm long; leaflets elliptic to elliptic-lanceolate, 4–8 cm long, 0.6–1.5 cm wide, sparingly pubescent above and below, obscurely to prominently glandular-punctate. Inflorescence columnar, 2–6 cm long; peduncle 3–10 cm long. Calyx sparingly pubescent and glandular, 5–7 mm long. Flowers 8–10 mm long; petals purple; wing petals 8–10 mm long; keel petals 7–8 mm long. Fruits obovate, 4–6 mm long, rugose, glabrous; seeds 3–4 mm long, 2–3 mm wide.
Chromosome number: unreported.
Flowering: May-Jun; south-central U.S.A., Oklahoma and Arkansas, south to e Texas, Louisiana, Mississippi and Alabama in mostly low sandy soils and/or marshy areas.

10. Orbexilum stipulatum (Torr. & A. Gray) Rydb., N. Amer. Fl. 24: 6. 1919. Fig. 4
Perennial herbs to 1 m tall. Stems striate, sparingly pubescent to glabrate, the roots unknown. Leaves pinnately trifoliolate; petioles 1.0–3.5 cm long; blades elliptic to oblong-lanceolate, glabrate and eglandular above and below. Inflorescence ovoid, 1–2 cm long; peduncles 4–10 cm long. Calyx
sparingly pubescent, 6–8 mm long. FLOWERS
10–11 mm long; petal color unknown; banner elliptic, 10–11 mm long, 5–6 mm wide; wing petals 9–10 mm long; keel petals 8–9 mm long. FRUITS unknown.
CHROMOSOME NUMBER: unreported.
FLOWERING: Jun; occurring in “flood-scoured river bank bedrock, gravel bars, and limestone barrens and glades” (McCormick, 2007).

This species is known only by collections from Rock Island, a locality just below the Falls of the Ohio river where it descends into the state of Kentucky. First collected by C.W. Short in 1841, it was last collected in 1881 and is now presumably extinct (McCormick, 2007). I follow Grimes (1990) in positioning this taxon in the genus *Orbexilum*, although it might belong elsewhere in that the fruit is unknown (Rydberg, 1928).

11. *ORBEXILUM VIRGATUM* (Nutt.) Rydberg, N. Amer. Fl. 24: 6. 1919. Fig 9

*Psoralea virgata* Nutt., Gen. N. Amer. 104. 1818.

PERENNIAL HERBS to 0.5 m tall. STEMS slender, appressed-pubescent, arising from well-defined ovoid or globose tubers. LEAVES unifoliolate, 0.1–3.5 cm long; petioles 0.1–3.5 cm long; blades elliptic to narrowly lanceolate, mostly 2–9 cm long, 0.3–1.2 cm wide. INFLORESCENCE an ovoid to long-ellipsoid spike 1-4 cm long; peduncles 2–13 cm long. CALYX 3–5 mm long, appressed-pubescent, glandular, 10-veined. FLOWERS mostly 5–7 mm long; petals purple; banner obturrulate, 5–7 mm long, 4–5 mm wide; wing petals 6–7 mm long; keel petals 6–7 mm long. FRUIT round-ovobate, ca. 4 mm long, 4 mm wide, rugose, glabrous, glandular; seeds obovate, ca. 2 mm long.

CHROMOSOME NUMBER: unreported.
FLOWERING: May-Jun; mostly along swamps and highways in flat pine barrens, north-eastern most Florida and closely adjacent Georgia.

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The dot maps are based upon the work of Grimes (1990), Isely (1998), specimens on file at LL, TEX, and from data provided by federal and state sources on the web, at least where they seemed accurately portrayed according to my own studies of the taxa concerned.

**LITERATURE CITED**