

**SOLIDAGO MAYA,
(ASTERACEAE: ASTEREAE: SOLIDAGO SUBSECT. MARITIMAE)
A NEW SPECIES OF GOLDENROD
FROM SOUTHERN MEXICO, GUATEMALA, AND BELIZE**

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ABSTRACT

A new species of *Solidago* subsect. *Maritimae*, ***Solidago maya* Semple, sp. nov.**, is described from collections made in the highlands of Chiapas, Mexico, and the Maya Mountains of eastern Guatemala and Belize. The species is most similar to *S. mexicana* and *S. virgata*.

Solidago subsect. *Maritimae* (Torr. & Gray) G.L. Nesom includes 13 species of goldenrods occurring in bogs, marshes, seepage, and other normally continuously moist habitats. All species have basal rosette and lower stem leaves that sheath the stem, while middle and upper stem leaves do not. Inflorescences vary from elongated, narrow (short branched) to conical (longer lower branched) arrays that are apically secund (most species) to non-secund, with some species including both secund and non-secund arrays. Differences in the degree of apical dominance determine whether or not lower branches of larger inflorescences remain short and suppressed or are elongated. In some cases, only the lowermost branches are greatly elongated. Different growth forms of the arrays are illustrated in Semple (2012, 2013, 2016 frequently updated).

Among members of subsect. *Maritimae*, Semple (2013) clarified the misapplication of the name *Solidago stricta* sensu authors (including Semple & Cook 2006) to the southeastern USA coastal plain taxon that has non-serrate lower stem leaves and narrow, apically non-secund inflorescences with short branches regardless of the robustness of the shoot; these plants are correctly treated as *S. virgata* Michx. The name *S. stricta* Ait. is correctly applied to the rare eastern Virginia and southern New Jersey pine baron taxon with serrate lower stem leaves and inflorescence that have long ascending-diverging lower branches in robust shoots. Mexican members of subsect. *Maritimae* are *S. paniculata* DC., native to central Mexico in wetter areas of the Mexico City region and eastern Michoacán, and *S. mexicana* L., native along the Gulf coast of Tamaulipas, Veracruz, and Tabasco in dunes at low elevations. Collections of the coastal plants have been identified as *S. mexicana*, *S. sempervirens* var. *mexicana* (L.) Fern. (or subsp. *mexicana* (L.) Semple), or as *S. stricta* sensu authors not Ait.

Plants from the highlands of Chiapas, Mexico and the Maya Mountains of eastern Guatemala and southwestern and central Belize have been identified as *Solidago mexicana* (and synonyms) or *S. stricta* but they are not identical to the Gulf coastal plants. McVaugh (1972) noted the occurrence of these plants in Chiapas and concluded they were similar to *S. stricta* (sensu auth. not Ait.). Following McVaugh, Nash (1976) treated the highland plants as *S. stricta*. Semple et al. (2016) have presented a multivariate morphometric analysis of the *S. sempervirens* L. complex, which includes the plants from Chiapas, Guatemala, and Belize. Statistical support was found for recognizing these highland plants as a separate species.

SOLIDAGO MAYA Semple, sp. nov. **TYPE: MEXICO. Chiapas.** Mpio. San Cristobal Las Casas, extensive marsh at S end of the Valley of San Cristobal, elev. 2200 m, 23 Oct 1971, D.E. Breedlove & R. Thorne 21282 (holotype: MO). Figures 1-3.

Solidago maya is similar to *S. mexicana* from Texas and Mexico but differs from it in having fewer stem leaves, shorter midstem leaves, slightly wider midseries phyllaries, and slightly smaller ray floret ovaries at anthesis. As well, involucre height averages about a half a millimeter less in *S. maya* (3.9 mm) than in western *S. mexicana* (4.45 mm). *Solidago maya* is known from the mountains of Chiapas, Mexico, and the Maya Mountains of eastern Guatemala and southwestern and central Belize, while *S. mexicana* occurs at near sea level along the Mexican coast from Tamaulipas to Tabasco and north to Maryland along the Gulf and Atlantic coasts of the USA.

Plants 39–68–102 cm, rootstock a short, thick, decumbent to ascending woody caudex, single- to multi-stemmed. **Stems** erect, proximally glabrous, distally glabrous to sparsely strigose in inflorescence. **Leaves:** basal rosette and lowest stem leaves narrowly oblanceolate, 60–110–230 × 7–12–20 mm, tapering to winged petiole, the petiole base sheathing the stem or nearly so, entire, apex usually somewhat spinulose; mid stem leaves sessile, blades narrowly lanceolate, 18–44–75 × 2–5.7–12 mm, tapering to sessile base, shiny glabrous, apices acute, margins entire, sometimes ciliate; upper stem leaves sessile, blades narrowly lanceolate to linear lanceolate, 14–29–50 × 1.5–3.5–7.5 mm, much reduced distally, glabrous, margins entire. **Heads** 25–150+, in narrow thyriform or apically secund conical arrays (Fig. 4) 8–20–31 cm tall × 2–4.3–14.5 cm wide, branches 1.5–10 cm, usually ascending to somewhat diverging, heads secund on longest branches of large arrays, bracts few to many, linear lanceolate. **Peduncles** 1–15 mm, glabrous to moderately short villosio-hirtellous; bracteoles few, often distal, grading into phyllaries, very linear-lanceolate. **Involucres** cylindrical when fresh, but spreading distally when pressed, 3–3.8–4.7 mm. **Phyllaries** in 3–4 series, broadly to narrowly lanceolate, unequal (outer 1/4–1/3 length of inner), margins entire to slightly fimbriate distally, apices acute, glabrous; central vein thicker basally. **Ray florets** 1–6–8; laminae yellow 1.6–2.3–3 × 0.6–0.73–0.9 mm; ovary 0.5–0.83–1.1 mm at anthesis, sparsely to moderately strigillose, pappi 2.8–3.4–4.1 mm at anthesis, longest slightly clavate, others narrow, tapering. **Disc florets** yellow, 5–9–12; corollas 2.9–3.8–4.5 mm, lobes 0.6–0.9–1.3 mm; ovary (narrowly obconic) 0.5–0.1.2–1.5 mm at anthesis, sparsely strigillose; pappi 2.8–3.6–4.2 mm, longest slightly clavate. **Mature cypselae:** fruit body 1.7–2.3 mm, pappi 3.2–4.3 mm. **Chromosome number:** unknown. Means in **bold face**.

Distribution and habitat. The species occurs predominantly in the Sierra Madre de Chiapas of central Chiapas, Mexico, and disjunct in the Maya Mountains of eastern Guatemala and Belize. Bogs, shrubby second growth slopes, moist pastures, grasslands, pinelands, forests, on steep moist slopes with *Quercus* spp.; 460–2160 m (1500–7100 ft). Elevations are 1060–2160 m in Chiapas, ca 460 m in Guatemala and Belize. *Solidago maya* is allopatric with other native species of *Solidago* in Mexico and Central America.

Etymology. The species epithet is a noun in apposition honoring Mayan people in the general area where the species occurs.

Collections examined. **BELIZE.** Dept. Cayo: Mt. Pine Ridge, Skyline Drive, in grassland, 21 Jun 1967, *Brunt* 2289 (BM). **GUATEMALA.** Dept. Petén: 3 km W of village of Dolores, pineland, 19 Apr 1961, *Contreras* 2135 (F, MO). **MEXICO. Chiapas.** No date, *Ghiesbreght* 124 (GH); about Ocuilapa, table land, 21 Aug 1895, *Nelson* 3006 (GH); Salul Ja, 5 km E of la cabecera de Amatenango, bosque, 3 Sep 1988, *J. Lopez Pérez* 420 (TEX); Mpio. Ocosingo, 16 km NE of Oxchuc along road to Ocosingo, shrubby second growth slope, 23 Sep 1972, *Breedlove* 27763 (F, MO); Mpio. San Cristobal las Casas, S end of the valley of San Cristobal las Casas, large bog, 3 Aug 1966, *Breedlove* 14705 (F), S end of Valley of San Cristobal, bog, 24 Aug 1964, *Breedlove* 7108 (F); Mpio. Tenejapa, Tenejapa, on steep moist slope with *Quercus* spp. in the paraje of 'Oshe Wits, 28 Nov 1964, *Breedlove* 7769 (F); Mpio. Teopisca, NE edge of Teopisca along MEX-190, large moist pasture, 25 Jun 1965, *Breedlove* 10540 (F). McVaugh (1972) cited several additional collections that I have not seen.



Figure 1. Holotype of *Solidago maya* Semple: Breedlove & Thorne 21282 (MO).

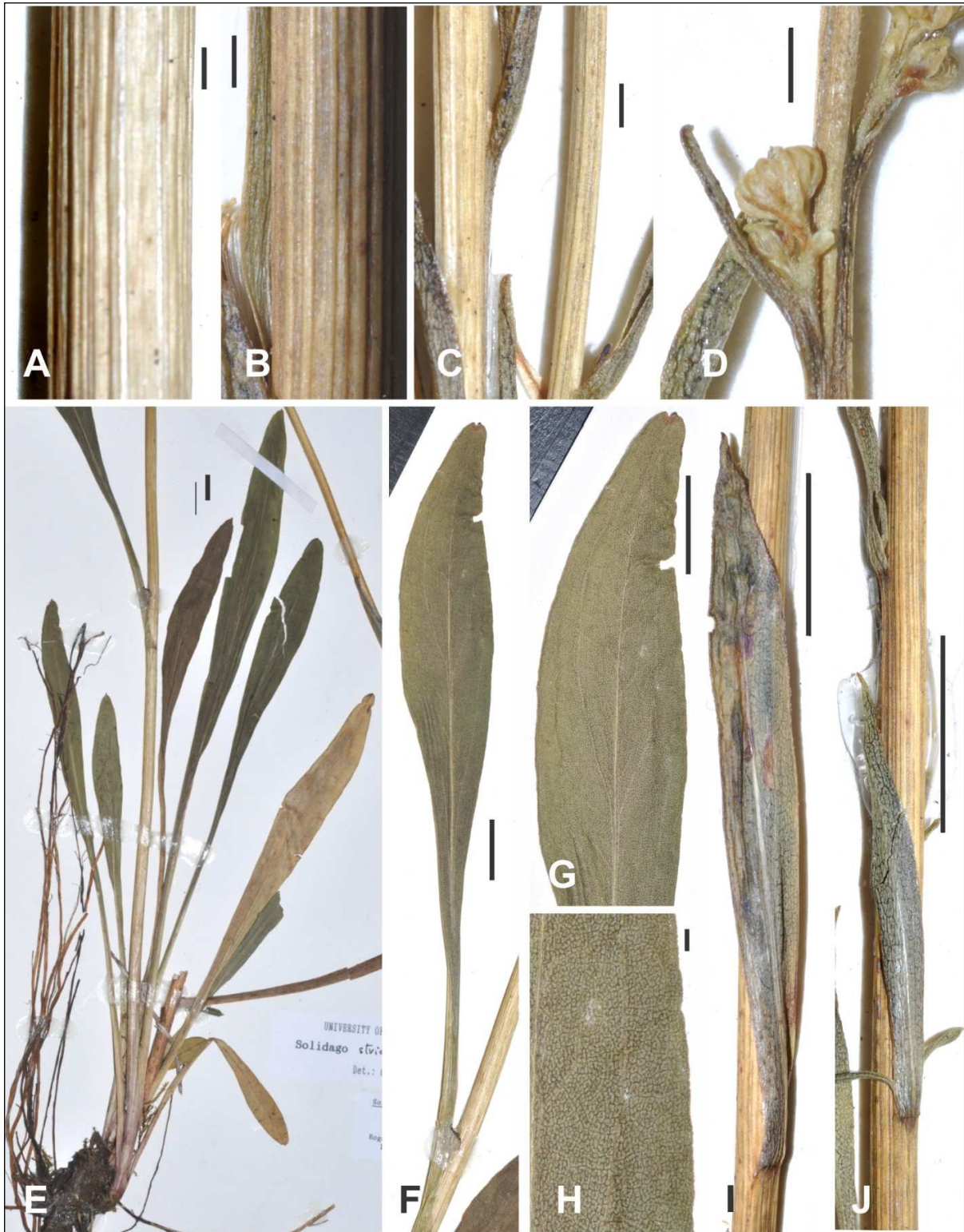


Figure 2. Details of holotype of *Solidago maya*: stem and leaves. **A-C**. Lower, mid and upper stems. **D**. Inflorescence branch and peduncle. **E**. Basal rosette leaves. **F-H**. Lower mid stem leaf and adaxial surface details. **I-J**. Upper stem leaves. Scale bar = 1 cm in E-G and I-J; = 1 mm in A-D, and H.

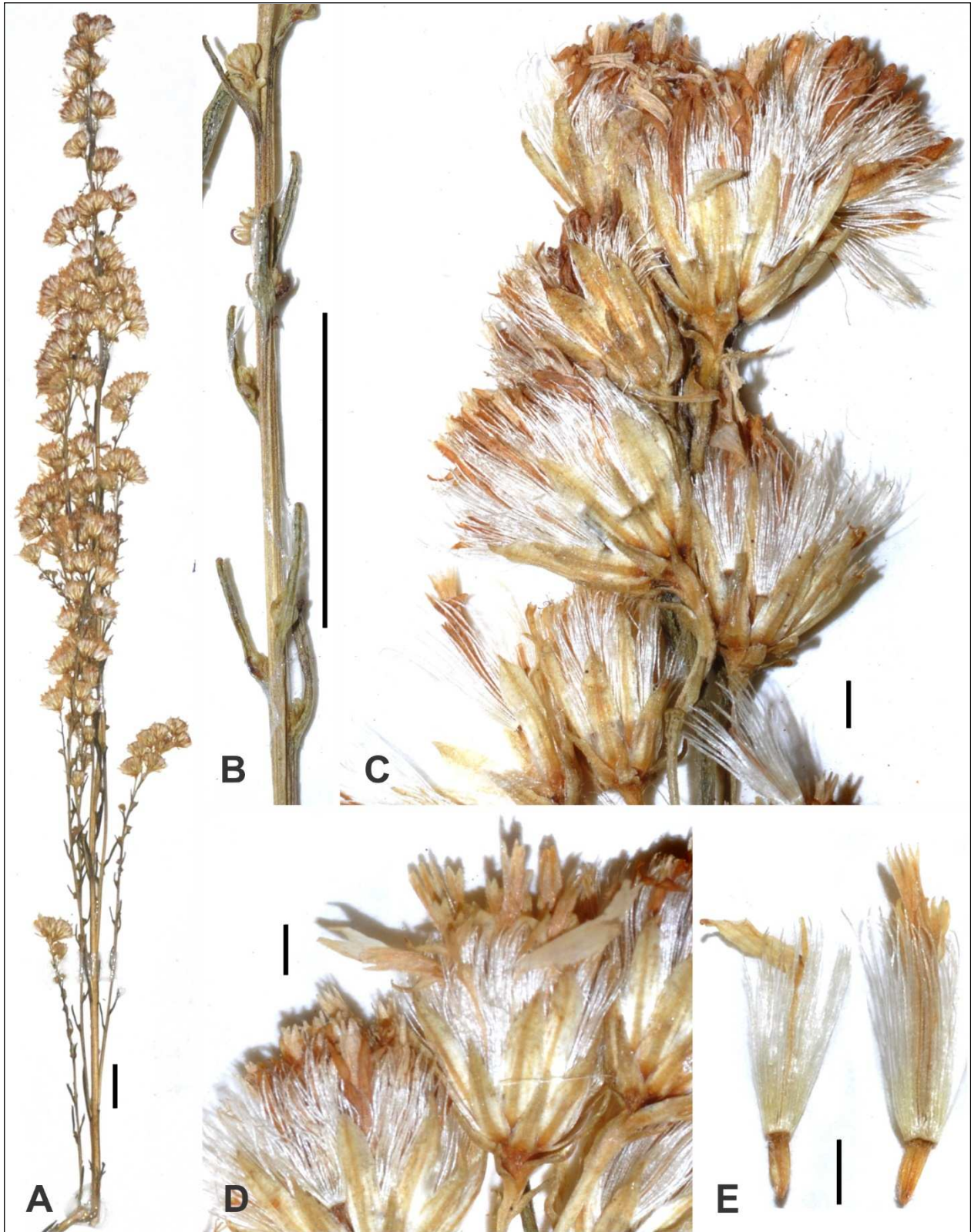


Figure 3. Details of holotype of *Solidago maya*: floral features. **A.** Inflorescence. **B.** Portion of lower inflorescence branch and bracts. **C.** More mature heads. **D.** Flowering heads. **E.** Ray and disc floret at anthesis. Scale bar = 1 cm in A-B; = 1 mm in C-E.



Figure 4. Inflorescence array variation in *Solidago maya*: floral features. **A.** *Ghrisbacht 124* (GH). **B.** *Breedlove 27763* (F). **C.** *López Pérez 420* (TEX). **D.** *Contreras 2135* (F). Scale bar = 10 cm in A-C; 1 cm in D.

Solidago maya is most similar to some diploid plants of *S. mexicana* from Florida and to diploids of *S. virgata* from Florida, less so to tetraploids of *S. mexicana* from coastal Texas and Mexico and even less so to *S. sempervirens* and *S. azorica*. A multivariate morphometric analysis of the *S. sempervirens* complex plus *S. virgata* of the *S. stricta* complex was undertaken to clarify morphological limits of the taxa involved (Semple et al. 2016). The study included 38 vegetative and floral traits scored on 119 specimens of the *S. sempervirens* complex of *Solidago* subsect. *Maritimae* (*S. azorica*, *S. maya*, *S. mexicana*, *S. paniculata*, and *S. sempervirens*) and *S. virgata* of the *S. stricta* complex. In the multivariate study, *S. maya* separated weakly to strongly from other taxa depending upon the number of a priori groups included in an analysis and whether or not *S. mexicana* samples were treated as a single a priori group or were split into eastern (diploid) and western (tetraploid) a priori groups. In the analysis comparing just *S. maya* and western *S. mexicana*, all nine specimens of *S. maya* were placed a posteriori into the *S. maya* group (6 specimens 96-100% probability, including the holotype; one specimen each with 87%, 76%, and 70% probabilities). Specimens of *S. maya* from across the range in central and eastern Chiapas and eastern Guatemala and Belize were included in the analysis. The details of the study are presented in Semple et al. (2016) and are not replicated here.

The inflorescence variation illustrated in Fig. 4 is similar to that occurring in *S. mexicana*. Small inflorescences with relatively few heads are similar to small inflorescences of *S. austrina*, *S. gracillima*, *S. stricta*, and *S. virgata*, but the larger arrays have a branching pattern that does not occur in *S. virgata*, which retains the narrow non-secund wand-shaped form even in robust plants. The holotype does not appear to have the secund apex usually present in mid to large arrays of *S. mexicana*, but its lower long proximally ascending to distally diverging branches are like the lower longer branches in arrays of *S. mexicana*. The branching patterns of larger arrays of *S. austrina*, *S. gracillima* and *S. stricta* are different than those of *S. maya* in the branching angle, the number of elongated lower branches and in the amount of branch curvature.

Nash (1976) noted the occurrence of what she referred to as *Solidago stricta* in Chiapas and assumed that it was likely present in adjacent Guatemala and cited McVaugh (1972). Her illustration of “*S. stricta*” (Fig. 40, p. 495) is *S. maya*. The illustration does not match any of the collections listed above.

No collections of *Solidago maya* from the central and western highlands of Guatemala were seen among specimens at BM, F, GH, MO, and TEX. John Pruski (pers. comm., September 2016) of the Missouri Botanical Garden indicated that the apparent gap may be real because the area between the disjunct populations is lower in elevation, although there has been only limited collecting in this area.

Key to species of *Solidago* subsect. *Maritimae* in Mexico, Guatemala, and Belize

(All species have basal rosette and lower stem leaves with leaf bases sheathing or nearly sheathing the stem.)

- 1. Upper stem leaves not greatly reduced, 85–110 × 12–15 mm; inflorescences usually leafy; introduced in Veracruz, Mexico **Solidago sempervirens**
- 1. Upper stem leaves reduced, 10–77 × 1.5–7 mm; native to Mexico and Guatemala; inflorescences with reduced leaves.
 - 2. Rays 9–21 averaging 15, native to Mexico D.F. and Michoacán, Mexico . **Solidago paniculata**
 - 2. Rays 6–10 averaging 5–7; Gulf coastal plain of Mexico and highlands in Chiapas, Guatemala and Belize.
 - 3. Upper 1/4 of stem usually with short nodes and many leaves (averaging 25); 0–30 m elev., Gulf coastal plain, Mexico from Tamaulipas to Tabasco **Solidago mexicana**
 - 3. Upper 1/4 of stem with few leaves (averaging 9); 460–2200 m elev., highlands in central Chiapas and Guatemala **Solidago maya**

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