

NEW SPECIES, NAMES, AND COMBINATIONS IN MEXICAN *BIDENS*
(ASTERACEAE: COREOPSIDEAE)

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ABSTRACT

In the preparation of a taxonomic treatment of *Bidens* for México we have found it necessary to describe three new species: *B. balsana* T. Melchert (from Guerrero), *B. oaxacana* T. Melchert (from Oaxaca), and *B. saltillensis* T. Melchert (from Coahuila); two new varieties: *B. aequisquama* (Fern.) Sherff var. *guanajuatensis* T. Melchert (from Guanajuato) and *B. sharpii* (Sherff) T. Melchert var. *tamazulapana* T. Melchert (from Puebla and Oaxaca); four new specific combinations: *B. cronquistii* (Sherff) T. Melchert, *B. hintonii* (Sherff) T. Melchert, *B. pueblensis* (Sherff) T. Melchert, and *B. sharpii* (Sherff) T. Melchert; and four new varietal combinations: *B. acrifolia* Sherff var. *langlassei* (Sherff) T. Melchert, *Bidens chiapensis* Brandegee var. *feddemana* (Sherff) T. Melchert, *comb. nov. B. odorata* Cav. var. *rosea* (Schultz-Bip.) T. Melchert, and *B. schaffneri* (A. Gray) Sherff var. *wrightii* (A. Gray) T. Melchert. When appropriate, the relationships of these various taxa are discussed. Especially noteworthy is the treatment of *B. cronquistii* and *B. hintonii*, both of which were originally positioned in the genus *Coreocarpus*, and *B. acrifolia* var. *langlassei* which is transferred from *Cosmos*.

KEY WORDS: Asteraceae, Coreopsideae, *Bidens*, *Coreocarpus*, México.

The senior author and several of his former students have conducted extensive cytotaxonomic and comparative flavonoid studies within and among the more difficult genera of the Mexican and Central American Coreopsideae (*Cosmos*, Melchert 1967, 1968; *Dahlia*, Sorensen 1969; Giannasi 1972; *Coreopsis*, Crawford 1969; *Bidens*, Hart 1973, Ballard 1975, Roseman 1986; and *Thelesperma*, Melchert 1963). The broad taxonomic overview gained through this

combination of studies, which were largely based upon populationally oriented research, augmented by experimental studies on greenhouse grown plants, has resulted in systematic treatments of the genera *Bidens*, *Cosmos*, and *Thelesperma*. In order that the revised concepts might be incorporated into the junior author's concept of these genera for the Asteraceae of México (Turner & Nesom, in prep.), the necessary new species descriptions, new names and new nomenclatural combinations are presented here. More detailed morphological, chromosomal, flavonoid and experimental crossing data relating to these will be published later.

***Bidens acrifolia* Sherff var. *langlassei* (Sherff) T. Melchert, *comb. nov.*
BASIONYM: *Bidens langlassei* Sherff, Bot. Gaz. (Crawfordsville) 64:24.
1917. ≡ *Cosmos langlassei* (Sherff) Sherff, Field. Mus. Publ. Bot. 8:425.
1932.**

ADDITIONAL SPECIMENS EXAMINED (OTHER THAN THE TYPE):
MÉXICO. Guerrero: Distr. Mina. Guayameo-Filo, oakwoods, 1240 m, 12 Sep 1936, Hinton, et al. 9388 (G, MICH, NY, US).

Sherff, in his original description, correctly positioned this taxon in *Bidens*. He later transferred it to *Cosmos* because its general habit was "more that of a *Cosmos* than *Bidens*," an arrangement which Sherff (1955) retained in his treatment for the North American Flora. Since a meaningful analysis of the characteristics distinguishing *Cosmos* and *Bidens* would require detailed comparisons of their flavonoid chemistries, such a discussion cannot be fully undertaken here. At a morphological level suffice it to note that: (1) Many *Bidens* species (e.g., *B. pilosa* L., *B. odorata* Cav., *B. mollifolia* Sherff, *B. pringlei* E. Greene, etc.) characteristically bear square or tetragonal stems, whereas only terete stems are known in *Cosmos*; 2) while linear-tetragonal achenes are basic in both genera, only those of *Bidens* display 3 or more, nearly equally developed, elongated ribs on each face; and 3) while the filaments of *Bidens* are glabrous and somewhat elastic (i.e., readily stretched by the emerging style branches), those of *Cosmos* are invariably pilose and relatively inelastic. Since *Cosmos langlassei* has all of the traits characteristic of *Bidens*, there is little doubt that it is properly positioned in *Bidens*. Moreover, "*Cosmos langlassei* is morphologically all but indistinguishable from *B. acrifolia* Sherff (including *B. polyglossa* Sherff) both of which Sherff himself correctly positioned within *Bidens* (1955; 1964). All have sharply squared stems arising from a short woody crown; well spaced, deeply 2-3 pinnatisect leaves that are broadly triangular in outline; distinctive heads with 8-12 narrowly oblanceolate, two toned yellow rays subtended by (8-)11-16 narrowly linear-subulate outer involucre bracts; exaristate, linear-tetragonal achenes (some with 2 tiny smooth or weakly barbed awns), the innermost of which becomes purplish brown and slightly recurved apically (when mature). Indeed,

the only characters which distinguish between *Bidens acrifolia* (including *B. polyglossa*) and "*Cosmos*" *langlassei* are leaflet size and shape, and stem/leaf pubescence patterns as follows:

1. Ultimate segments linear oblanceolate to 2.5 mm wide; stems with scattered appressed hairs, especially above; the leaves obscurely hispidulose var. *acrifolia*
- 1' Ultimate segments narrowly linear to linear filiform, 0.5-0.8(-1.0 mm) wide throughout; stems glabrous and leaves much more remotely pubescent var. *langlassei*

Given the fact that leaf dissection patterns are generally highly variable in *Bidens* (3-5 partite and 2-3 pinnatisect leaves commonly segregating within single populations), var. *langlassei* may ultimately prove to be nothing more than a narrow leafleted, nearly glabrous form of *B. acrifolia*. However, since var. *langlassei* is known definitely only from southwestern Guerrero (and perhaps adjacent Michoacán), with var. *acrifolia* occurring in Jalisco, Sinaloa, and Durango, I have chosen to treat them provisionally as geographical variants of a single species.

The chromosome number of var. *acrifolia* is $n = 10$, a relatively uncommon number in *Bidens* (reported as *B. polyglossa*); that of var. *langlassei* is, unfortunately, unknown.

Bidens aequisquama (Fern.) Sherff var. *guanajuatensis* T. Melchert, var. nov. TYPE: MÉXICO. Guanajuato: Route 110, 8.6 mi E of Cd. Guanajuato, near km 87, locally abundant in undisturbed areas of oak covered hillside, 11 Oct 1971, Melchert, Ballard & Hart 71-94 (HOLOTYPE: TEX; Isotype: MEXU).

Bidens aequisquamae (Fern.) Sherff var. *aequisquamae* similis sed caulibus singulis (vs. fasciculatis), foliis 3(-5) pinnatisectis, segmentis lanceolati-ovatis pubescentibus, in superficibus ambabus, et involuorum bracteis exterioribus plerumque 7-10 (vs. 11-13).

ADDITIONAL SPECIMEN EXAMINED: MÉXICO. Guanajuato: Mpio. de Dolores Hidalgo, 8-10 km above (northeast of) Santa Rosa, steep slopes in oak forest, red clay soil with abundant humus cover, 2500-2600 m, 17 Sep 1967, McVaugh 23954 (MICH).

In addition to the characters referred to in the above diagnosis, var. *guanajuatensis* possesses weakly trimorphous achenes, i.e., though mostly black, linear-subtetragonal and biaristate as in var. *aequisquama*. several achenes near the periphery of each head are 4.0-5.5 mm long and bear prominent yellow ribs (2 lateral, 1 ventral and sometimes 1 dorsal), plus scattered small yellow

papillae on the blackish, inter-rib areas, such achenes occur just interior to shorter (3.5-4.0 mm long), totally yellow, linear-clavate, peripheral achenes of the fruiting heads (similar yellow peripheral achenes have been observed in a few individuals from var. *aequisquama* populations).

It is entirely possible that var. *guanajuatensis* is a distinct species. In addition to its obvious relationship to var. *aequisquama*, its overall habit also suggests a close relationship to the large rayed forms of *Bidens mollifolia*, which occur in the states of Michoacán, Jalisco, and México. Although plants of the *B. mollifolia* complex develop diagnostic small, black, epappose, clavate or linear-clavate achenes, studies by the senior author have shown that it is common for a few achenes in totally mature fruiting heads of *B. mollifolia* to develop yellow papillae or small irregular, yellow, calluslike marginal ridges. Other than being epappose, such *B. mollifolia* achenes are rather similar to the short yellow outer, but biaristate achenes seen in var. *guanajuatensis*. Additional study is needed.

Bidens balsana T. Melchert, *spec. nov.* TYPE: MÉXICO. Guerrero: Low mountains 7.4 mi east of Chilpancingo on the road to Tixtla, plants along roadcuts in dry hilly area with small oak, "annual-like" plants with awned achenes and yellow rays with or without a red basal anthocyanin spot (as in 206 A); or awnless perennial plants (as in 206 B); or single awned, seemingly perennial plants (as in 206 C), 21 Oct 1971, Melchert, Ballard & Hart 206 (HOLOTYPE: TEX; Isotype: MEXU).

Bidens serrulata (Poir.) Desf. var. *sharpii* Sherff similis sed differt plantis perennibus (vs. annuis) et involucrorum bracteis interioribus moderate vel dense puberulis (vs. glabris).

Erect perennials 80-100(-160) cm tall, arising from a short rhizome, often multibranching from the base. Stems terete, mostly glabrous, but some with scattered pilose hairs near the base (glaucous and totally glabrous in the greenhouse). Leaves either tripartite with deeply toothed, ovate segments, or deeply and evenly 2-3 pinnatisect with numerous lance-linear segments (involute and appearing subfiliform when growing under very dry conditions), the primary segments at right angles to the midrib. Heads radiate, numerous, 4-5 cm across the expanded rays, each with a tuft of hairs at its base. Ray florets mostly 5 per head. Ligules two toned yellow with a distinctive irregularly shaped, maroon-red anthocyanin spot at their base, mostly 20-22 mm long, 8-11 mm wide, the red spot varying considerably in size, essentially absent in some individuals. Outer involucre bracts (9-)11-15, narrowly linear, 4-6 mm long, 0.3-0.4 mm wide, ciliate. Inner bracts moderately pubescent. Disc florets numerous, yellow with a red spot just above the tube. Pales narrowly linear, rounded apically, reddish brown above, becoming white with stripes below. Achenes dimorphous, several of the peripheral ones in each head subclavate.

3.5-6.8 mm long, at first olivaceous, but becoming yellowish or rubrocastaneous; inner achenes blackish, narrowly linear-tetragonal. 6-9(-11) mm long, tapering slightly toward both ends, short setose apically, exaristate, or the innermost with 1 or 2 short awns. Chromosome number, $n = 11$ pairs.

ADDITIONAL SPECIMENS EXAMINED: MÉXICO. Guerrero: 4.2 mi E of Chilpancingo on road to Chilapa, 21 Sep 1967, *Melchert, Crawford, & Averett 67-154* (IA, TEX); north slope of Cerro Alquitran, 10-14 km by road W of Mex. highway 95 and Mazatlán, granitic rocks, 2250-2450 m, 6 Dec 1966, *Anderson & Laskowski 4405* (F, G, MICH); Cerro Alquitran, Mpio. de Chilpancingo, 2250 m, 6 Dec 1966, *Rzedowski 23637* (MICH).

This species closely resembles *Bidens sharpii* (Sherff) T. Melchert var. *sharpii* (also $n = 11$), but is distinguished by its perennial habit and densely puberulent inner involucre bracts. Known only from two sites in Guerrero (Chilpancingo area); the two collections from Cerro Alquitran all with tripartite leaves and distinct red basal spots on their rays; those from the type locality with 2-3 pinnatisect leaves and ligules with or without the red basal spot. At the latter site, an extremely steep roadcut, some of the plants appeared annual-like (perhaps slow growing), while some were definitely perennial. Interestingly, the type of the annual, *B. sharpii*, the only collection of this annual species from Guerrero, is also from this area (near Omitelmi).

***Bidens chiapensis* Brandegees var. *feddemana* (Sherff) T. Melchert, *comb. nov.* BASIONYM: *Bidens feddemana* Sherff, *Brittonia* 16:60. 1964.**

We would also place *Bidens macvaughii* Sherff (*Brittonia* 16:63. 1964) as synonymous with this taxon; as does McVaugh (1984). *Bidens chiapensis* has three geographically based morphological phases. Most collections of this species have been obtained from Chiapas and Guatemala, where all plants examined appear to be sprawling lignescent herbs, the radiate heads of which bear mostly eight, short, pale lemon yellow rays per capitulum. North of the Isthmus of Tehuantepec, the few available collections are all discoid. One collection is known from Oaxaca. Except for having discoid heads, the latter is essentially identical to the Chiapas-Guatemala plants (*i. e.*, appears prostrate and has three awned achenes). In contrast, the discoid plants from Guanajuato, Michoacán (*B. feddemana*), and Jalisco (*B. macvaughii*), are stout, erect shrubs with biaristate achenes. The erect shrubs are distinguished as var. *feddemana*, whereas the prostrate collection from Oaxaca is included here as a discoid form of the usually short rayed var. *chiapensis*. Chromosome numbers from the short rayed, prostrate, Chiapas-Guatemala populations are diploid with $n = 12$ pairs; those of the discoid populations are unknown.

***Bidens cronquistii* (Sherff) T. Melchert, *comb. nov.* BASIONYM: *Coreocarpus cronquistii* Sherff, *Brittonia* 16:433. 1964.**

Sherff presumably positioned this square stemmed, white rayed, "*Bidens odorata* like" "annual" (Smith, 1981 notes the plant to appear perennial in greenhouse grown material) in *Coreocarpus* because its small, obcompressed, marginally incurved, epappose achenes superficially resemble those of *Coreocarpus*. i.e., *have thick, corky wings along their somewhat inrolled lateral margins*. In total characters, however, this Guerrero endemic undeniably belongs to *Bidens*, being particularly close to (and perhaps conspecific with) *B. gracillima* Sherff, *B. minensis* Sherff, and *B. oligantha* Brandegee (including *B. anthriscoides* DC. var. *decomposita* Sherff). Like *B. cronquistii*, these are all small headed "*B. odorata* like" plants of the Sierra Madre del Sur with specialized achenes, neutral rays, and strongly dimorphic involucre (not possessing pistillate rays and essentially monomorphic involucre as in more "typical" *Coreocarpus* species).

In a recent biosystematic revision of *Coreocarpus*, Smith (1989) retained *C. cronquistii* (and its close relative *C. hintonii*) in *Coreocarpus*; but quite convincingly showed them to be morphologically and genetically distinct elements within the genus. Speculating on their phylogeny he noted that the plants of this distinct species pair "bear a striking resemblance to some species of *Bidens*," in particular, suggesting a possible relationship with the recently described *B. clavatus* Ballard which, like *B. oligantha*, etc., is yet another specialized member of the *B. odorata* species complex (with clavate achenes). Despite the many features which Smith listed that ally *B. cronquistii* (and *B. hintonii*) to *Bidens* (quadrangular stems, leaf dissection, ligule color, achene shape and chromosome number) he concluded that "their winged achenes, however, keep them in *Coreocarpus*." In our view, the inrolled marginal wings on *B. cronquistii* achenes were most likely developed through the enlargement and coalescence of yellow papillae and/or callus like ridges, such as occur along the introrse margins of many mature achenes of *B. oligantha*, *B. minensis*, and *B. gracillima*. Achenes intermediate between these extreme forms are known: MEXICO. Guerrero: Temisco, 350 m, 5 Nov 1937; *Mezía 8748* (F, G, MO, NY, TEX, UC, US).

The transfer of *Coreocarpus cronquistii* and *C. hintonii* to *Bidens*, leaves *Coreocarpus congregatus* (S.F. Blake) E.B. Smith (formerly *Coreopsis congregatus*) as the only somewhat discordant (sterile rayed, dimorphic involucre) element in *Coreocarpus*.

***Bidens hintonii* (Sherff) T. Melchert, comb. nov. BASIONYM: *Coreocarpus hintonii* Sherff. Brittonia 16:58. 1964.**

Sherff originally described this species as a *Coreocarpus*, no doubt because all, or at least the outer, achenes in each fruiting capitulum have yellow to brown, corky pectinate wings along their somewhat inrolled lateral margins (the innermost achenes in some heads being much narrower, slightly attenuated and yellowish at the tip, their margins and ventral midribs smooth or with

scattered small tuberculae). In its total characteristics, however, this species is very similar to members of the *Bidens mollifolia* polyploid complex, particularly the populations occurring from the state of México, westward. Like *B. hintonii*, these are square stemmed, white to rose rayed perennials with tiny black epappose achenes hidden among the chaff of the fruiting capitula. While most *B. mollifolia* achenes are clavate to linear clavate and wingless, our studies have shown that in totally mature fruiting heads it is common for a few achenes to develop yellow papillae and/or yellow callus like marginal ridges. It is very likely that the corky wings of *B. hintonii* are essentially an elaboration of the less ornate marginal outgrowths that occur in *B. mollifolia*.

Smith (1989) retained *Bidens hintonii* and *B. cronquistii* in *Coreocarpus*, but noted their morphological and genetic isolation within *Coreocarpus* and their close relationship to certain *Bidens* species (see above discussion under *B. cronquistii*).

Bidens hintonii was known to Sherff only by the type, a Hinton collection from Guerrero (Distr. Mina). We have examined an additional collection, as follows: MÉXICO. Guerrero: San Antonio, Montes de Oca, 20 Oct 1937, G.B. Hinton, et al. 11510 (GH, MICH, NY, US). The MICH specimen was inexplicably annotated by Sherff as *B. aequisquama* (Fernald) Sherff. Smith (1989) did not examine the above collection, but cited a recent additional collection from Guerrero, 6 km SE of Guayameo, 820 m, Villaseñor & Soto s.n. (UARK, MEXU).

***Bidens odorata* Cav. var. *rosea* (Schultz-Bip.) T. Melchert, *comb. nov.*
BASIONYM: *Bidens rosea* Schultz-Bip., in Seem. *Bot. Voy. Herald* 308.
1856.**

This is the correct varietal name for what heretofore has been called *Bidens odorata* var. *calcicola* (Greenm.) Ballard *ex* T. Melchert (1975). Sherff (1955), however, referred the latter name to varietal status under *B. pilosa*. Under the current *Code of Botanical Nomenclature* (1988), the varietal name *rosea* was automatically created with the publication of *B. rosea* var. *calcicola* Greenm. (1905); under article 26.2 of the present Code, the correct name should be var. *rosea*.

***Bidens oaxacana* T. Melchert, *spec. nov.* TYPE: MÉXICO. Oaxaca: Route 190, 39.8 mi SE of Totolapan (15.9 mi NW of Río Hondo bridge and 8.2 mi SE of El Camarón, adjacent to small roadside chapel; plants scattered on rather open dry, oak-pine covered hillsides, 18 Oct 1971, Melchert, Ballard & Hart 71-166 (HOLOTYPE: TEX; Isotype: MEXU).**

Bidens steyermarkii Sherff similis sed differt foliis 2-3 pinnatisectis segmentis ultimis lineari-filiformibus et acheniis minutis nigris sin pappo.

A rather small, often somewhat tufted, rhizomatous perennial with small, white rayed heads, young plants easily mistaken for annuals. Stems decidedly square. Leaves deeply 1-2 pinnatifid with linear filiform segments, these only 0.5-1.0 mm wide. Flowering heads with ca. 5 tiny white rays, these 4-5 mm long, obovate, apically truncated. Disc florets yellow. Fruiting capitula with numerous tiny, clavate achenes, these only 2.5-4.0(-5.0) mm long, black, glabrous, epappose, hidden by the pales. Chromosome number, $n = 12$ pairs.

ADDITIONAL SPECIMEN EXAMINED: MÉXICO. Oaxaca: ca. 105 km WNW of Tehuantepec, ca. 65 km SE of Totolapan, ca. 1300 m, 6 Nov 1970, *Cronquist & Fay 1-880* (IA, NY).

While other square stemmed, white rayed species of *Bidens* have small, clavate, epappose achenes (*B. mollifolia*, *B. clavata* Ballard, and *B. steyermarkii*), *B. oaxacana* is the only Mexican *Bidens* with such fruits, and with deeply bipinnatisect leaves with narrowly linear to linear filiform leaf segments, these mostly 0.5-1.0 mm wide. It's closest relative appears to be *B. steyermarkii*, a poorly known, once-collected species from western Guatemala.

Bidens pueblensis (Sherff) T. Melchert, *comb. nov.* BASIONYM: *Bidens bigelovii* A. Gray var. *pueblensis* Sherff, Bot. Gaz. (Crawfordsville) 88:287. 1929.

SPECIMENS EXAMINED: MÉXICO. Jalisco: ca. 28 mi W of Ayutla and ca. 70 mi NW of Autlán, 3 Nov 1963, *A. Cronquist 9743* (MICH, MO, NY, US). Michoacán: 4.5 mi E of Cojumatlán, cliffs overlooking SE shore of Lake Chapala, 7 Oct 1965, *A. Cronquist 10292* (NY). México: route 55, 0.5 mi N of Ixtapan de Sal, 23 Oct 1971, *Melchert, Ballard & Hart 71-288* (IA, TEX). México D.F.: Pedregal de San Angel, Sep 1927, *E. Lyonnet s.n.* (US). Guerrero: Mpio. de Tlacatepec, Cerro Tlacatepec, near village of Agua Fria, ca. 40 km N Coyuca de Benitez, 4 Dec 1963, *R. Feddema 2904* (MICH); Cerro Tlacatepec, near village of Agua Fria, ca. 40 km N Coyuca de Benitez, 4 Dec 1963, *Rzedowski 18134* (MICH). Oaxaca: route 190 ca. 35 mi NW Cd. Oaxaca, 19 Oct 1971, *Melchert, Ballard, Hart 71-185* (IA, TEX); 10 km S of Suchixtepec and 95 km N of Puerto Angel, 8 Nov 1970, *A. Cronquist, J. Fay 10897* (NY, US); Cerro San Felipe, 18 Oct 1908, *C. Conzatti s.n.* (FM). Puebla: Hacienda Baton, vicinity of Puebla. *Bro. G. Arsene s.n.* (US).

While the overall morphology of this taxon is very much like *Bidens bigelovii*, it is distinguished absolutely by the diploid chromosome complement ($n = 12$) and its five, tiny (4-5 mm), two toned yellow rays, each with a minuscule red anthocyanin dot at their base. Whether discoid or short radiate, *B. bigelovii* is always tetraploid ($n = 24$), and the ligules, when present, are either white, white with a red dot, or pale lemon yellow, the rays frequently varying from 2-5 per head within a given population.

Bidens saltillensis T. Melchert, *spec. nov.* TYPE: MÉXICO. Coahuila: San Lorenzo Canyon, "5.1 km (3.2 mi) en terraceria de la carretera

Saltillo a Zacatecas (54). 1 hora a pie arriba en el cañon," 2700-2800 m, forest of *Quercus*, *Cupressus*, and *Buddleja*, 18 Aug 1982, Clark P. Cowan 3559 (HOLOTYPE: TEX; Isotype: MEXU).

Bidens odoratae Cav. var. *rosea* (Schultz-Bip.) T. Melchert similis sed differt duratione perenni (vs. annui) et caulibus teretibus (vs. quadratis).

Perennial herbs 20-40 cm high. Stems glabrous or nearly so, seemingly terete (not clearly 4 sided), arising from a twisted, cordlike rhizomatous root (root present on only one specimen. Leaves simple or 3-4 parted, 3-8 cm long, the divisions linear lanceolate, mostly 2-4 mm wide, glabrous and entire (rarely a few marginal hispidulous hairs). Heads radiate, mostly 1-3 per stem, the ultimate peduncles 5-8 cm long. Involucres 5-6 mm high, the inner series purple, glabrous, the margins prominently white scarious, the outer series with mostly eight lanceolate, ciliate bracts 3-4 mm long. Receptacular bracts about as long as the florets, similar to the inner involucral bracts but linear lanceolate and narrowly acute. Ray florets 3-5, neuter, sterile (rarely a few reduced stamens or style branches), the ligules 9-11 mm long, 5-7 mm wide, white with 6-8 rosaceous veins. Disk florets 12-20, the corollas yellow, ca. 5 mm long, the lobes markedly short papillose pubescent. Anthers purplish brown with yellow appendages. Achenes (somewhat immature) linear, 8-12 mm long, brown, hispidulous, tetragonal below, somewhat tapering above, the pappus of mostly 2 awns 0.5-1.0 mm long, sometimes deciduous or absent.

ADDITIONAL SPECIMEN EXAMINED: MÉXICO. Coahuila: from above location at the same date, Cowan 3565 (MEXU, TEX); mountains near Saltillo, 3 Sep 1948, J. Greg 438 (G, MO).

The species superficially resembles the white rayed annual, *Bidens odorata* var. *rosea*, but differs markedly because of its perennial habit and nearly terete stems and 3-5 rayed heads. Indeed, it is the only white rayed perennial *Bidens* known to have terete stems.

Bidens schaffneri (A. Gray) Sherff var. *wrightii* (A. Gray) T. Melchert, *comb. nov.* BASIONYM: *Bidens heterophylla* Ortegies var. *wrightii* A. Gray. Proc. Amer. Acad. Arts 19:16. 1883.

ADDITIONAL SPECIMENS EXAMINED: MÉXICO. Chihuahua: 2 mi N of Madera, plants in moist ditch and adjacent cultivated fields, 2 Sep 1966, Melchert, Sorensen, & Crawford 6270 B (leaves deeply pinnatisect); 2 mi N of Madera, plants in moist ditch and adjacent cultivated fields, 2 Sep 1966, Melchert, Sorensen, & Crawford 6270 A (leaves linear lanceolate) (IA, TEX); ca. 10 mi N of Madera, above village of Bravo on west edge of Lago de Babicora, 1 Sep 1966, Melchert, Sorensen, & Crawford 6261 (IA, TEX).

This taxon (which also includes *Bidens insolita* Sherff) has long resided in synonymy under *B. aurea* (Ait.) Sherff and was so treated by Sherff (1955) in his treatment for the North American Flora. While *Bidens aurea* is mostly tetraploid with $n = 23$ pairs of chromosomes, *B. schaffneri* var. *schaffneri* and var. *wrightii* are both diploid with $n = 11$ pairs. The latter variety, which occurs mainly in central Chihuahua, differs from the more southern, primarily streamside, var. *schaffneri* in possessing simple and/or tripartite leaves with narrowly lanceolate blades, as well as deeply pinnatifid leaves and achenes with barbed pappus awns. In addition, var. *schaffneri* has proven fully compatible with var. *wrightii* in synthetic crosses (Melchert, unpubl.).

Bidens sharpii (Sherff) T. Melchert, *comb. nov.* BIONYM: *Bidens serrulata* (Poir.) Desf. var. *sharpii* Sherff, Bot. Leaflet 2:6. 1950.

SPECIMENS EXAMINED: MÉXICO. Oaxaca: route 190 ca. 14 mi S of Nochixtlán, King 2517 (TEX); along road from Ixtlán de Juárez to Villa Alta, 14 July 1968, Carman 68-39 (IA, TEX); route 190 ca. 15 mi NW of Yanhuitlán, 14 Sep 1967, Melchert, Averett, & Crawford 67-64 (IA, TEX); route 175, 21.5 mi N of jct with route 190 just N of El Cerezo, 18 Oct 1971, Melchert, Ballard, & Hart 71-179 (IA, TEX); route 190 31.5 NW of Cd. Oaxaca, 19 Oct 1971, Melchert, Ballard, & Hart 71-186 (IA, TEX); route 190 128 mi SE of Tamazulapan, 20 Oct 1971, Melchert, Ballard, & Hart 71-201 (IA, TEX).

This taxon, which Sherff misplaced in *Bidens serrulata*, is very common across central Oaxaca (one collection, the type, from central Guerrero). In sharp contrast with *B. serrulata*, which is centered in the state of México, var. *sharpii* mostly possesses a distinctive maroon red anthocyanin blotch at the base of their two toned yellow ligules. The size of this spot varies considerably. Though usually conspicuous, it may be quite small and difficult to see when pressed, or rarely even absent. Regardless of ray color, however, var. *sharpii* can be distinguished by its unique combination of (9-)11-15(-17) narrowly linear outer bracts, glabrous inner bracts (indeed the plant is glabrous throughout, except for a tuft of hairs at the base of each capitulum), and a chromosome number of $n = 11$. *Bidens serrulata* has totally yellow ligules (these also two toned but never with a basal red spot), 8 wide, outer involucre bracts, pubescent inner involucre, and a chromosome number of $n = 12$.

Bidens sharpii (Sherff) T. Melchert var. ***tamazulapana*** T. Melchert, *var. nov.* HOLOTYPE: MÉXICO. Oaxaca: Mpio. Tamazulapan, Cerro Pericón, al NW de San Pedro Nopala, ca. 2460-2660 m, "Veq. Ecetonia matorral espinoso-encinar. Suelo café rojizo sobre roca ignea," 21 Oct 1984, P. Tenorio L. 7882 (HOLOTYPE: TEX; Isotype: MEXU).

Bidens sharpii (Sherff) T. Melchert var. *sharpii* arcte similis sed differt bracteis interioribus receptaculi dorsaliter pubescentibus

(vs. *glabris*) et bracteis involueralibus ad apices purpuratis, area purpurata 1-2 plo longiore quam latiore.

Much resembling var. *sharpii* but the inner involueral bracts pubescent dorsally (vs. *glabrous*), the inner receptacular bracts purple apically, the purple area 1-2 times as long as wide.

ADDITIONAL SPECIMENS EXAMINED: MÉXICO. Puebla: Mpio. Caltepec, Maguey Manzo, El Gavilán al NW de San Simón, 3 Oct 1984, *Tenorio L. 7567* (MEXU, TEX); Cerro El Gavilán, SE de Caltepec, 1880-2320 m, 11 Oct 1984, *Tenorio L. 7644* (MEXU, TEX).

The var. *tamazulapana* resembles var. *sharpii*, but has involueral bracts moderately to densely pubescent with multicellular hairs; interior phyllaries with distinctive jet black tips, these rather sharply delineated basally (not elongated and gradually tapered as in var. *sharpii*); rays with or without the red basal anthocyanin spot (the holotype entirely yellow rayed); some of the disc florets with tiny dark spherical glands on their teeth. It is known only from three recent collections (cited above). While treated here as an isolated variant of *Bidens sharpii*, the combination of "*B. serrulata* like" multicellular involueral hairs, jet black chaff tips, yellowish anther appendages, tiny dark glands on some of its disc corolla teeth, and its somewhat isolated distribution, suggest that var. *tamazulapana* may very well prove to be a distinct local species. Additional study is needed to affirm its biological status.

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