

NEW NAMES AND COMBINATIONS IN *COSMOS*
(ASTERACEAE, COREOPSIDEAE)

Thomas E. Melchert

Department of Botany, University of Iowa, Iowa City, Iowa 52242 U.S.A.

ABSTRACT

A newly discovered white to pale pink rayed *Cosmos* "intercedens-like" tetraploid from Jalisco, México is described as a variety of the yellow rayed *Cosmos landii* Sherff (*C. landii* var. *achalconensis* var. *nov.*). A large headed, previously named, tetraploid race of *C. diversifolius* Otto, found to the south of México City is reduced to varietal rank as *C. diversifolius* var. *dahlioides* *comb. nov.* *Cosmos stellatus* Sherff is treated as a geographically isolated variety of *C. sessilis* Sherff (*C. sessilis* var. *stellatus* *comb. nov.*; and the Jalisco endemic, *C. diversifolius* var. *deficiens* Sherff is elevated to species status (*C. deficiens* *comb. nov.* Illustrations and discussions relating to these proposals are presented.

KEY WORDS: Asteraceae, Coreopsideae, *Cosmos*, México.

The main purpose of this publication is to put forward several new *Cosmos* names and combinations so that they can be included in the author's treatment of the genus in the soon to be published Asteraceae of México (Turner & Nesom, in prep). More detailed data will be published elsewhere.

Cosmos diversifolius Otto var. *dahlioides* (S. Wats.) Melchert, *comb. nov.* BASIONYM: *Bidens dahlioides* S. Wats., Proc. Amer. Acad. Arts 26:142. 1891. MÉXICO. México: hills Flor de María, 3 Sep 1890, Pringle 3168 (HOLOTYPE: GH!; Isotype: F!).

ADDITIONAL SPECIMENS EXAMINED: MÉXICO. D.F.: ca. 6.5 mi N of Tres Cumbres along toll road from Cuernavaca to México City (Route 95D), plants growing in deep rich soil of grain fields on gradual slope of volcanic mountain, 15 Aug 1965, Melchert & Sorensen 6113 (IA, TEX); old highway 95, 5.5 mi S of jct with road to Ajusco (at km 65), plants in grassy area along

roadside, area of pine and fir. 18 Sep 1967, Melchert, Crawford, & Averett 67-123 (IA).

Though widespread in southern and eastern México, *Cosmos diversifolius* Otto is particularly common in the states of Oaxaca, Chiapas, Hidalgo, and San Luis Potosí. As suggested by its name, it includes a wide variety of vegetative forms (plants strictly *scapose* with once pinnatifid leaves, *subscapose* with a mix of simple and once pinnatifid leaves, or with well spaced, sometimes coarsely dentate, *cauline* leaves). A wide array of vegetative forms found in Oaxaca were all shown to be diploid ($n=12$ [Melchert 1968]), but more recent counts of the species from several Hidalgo and San Luis Potosí populations were uniformly tetraploid ($n=24$ [Melchert, unpubl.]). As of yet, no morphological features have been discerned which distinguish between the diploid and tetraploid races.

The name proposed by Watson in his original description calls attention to the very large attractive heads which superficially resemble those of *Dahlia*. The small cluster of populations concerned are tetraploid ($n=24$) and known only from the area of Tres Cumbres, México, D.F. Though clearly part of the *Cosmos diversifolius* species assemblage, they are distinguished at a glance from other diploid or tetraploid populations of var. *diversifolius* by their exaggerated floral features: heads mostly 7.0-9.2 cm across the expanded rays, not mostly 5-6 cm across as in var. *diversifolius*; ligules 4 cm long, 2 cm wide; outer involucre bracts markedly foliose, often 10-12 mm long, (4.5)5.0-7.0 mm wide, usually much overlapping laterally, not mostly 3.0-4.0(4.5) mm wide as in var. *diversifolius* (Figures 1, 2, 3). Additionally, var. *dahlioides* is typically *scapose* with glabrous leaves that are either broadly spatulate or once pinnate with 3-5 entire, lance ovate segments, i.e., they are vegetatively much more uniform than var. *diversifolius* plants.

Whether var. *dahlioides* is strictly a local evolutionary product, or related phylogenetically to similar appearing, large headed *Cosmos diversifolius* plants from Guatemala and South America remains an open question.

Cosmos deficiens (Sherff) Melchert, *comb. nov.* BASIONYM: *Cosmos diversifolius* Otto var. *deficiens* Sherff, Brittonia 16:65. 1964. MÉXICO. Jalisco: pine oak forest W of summits, alt. 1900-2000 m, Sierra de la Campana, along road to Mascota, 7-8 mi NW of Los Volcanes, 23-25 Oct 1952, McVaugh 13747 (HOLOTYPE: MICH!).

ADDITIONAL SPECIMENS EXAMINED (all topotypes): MÉXICO. Jalisco: road from Los Volcanes to Mascota, 9 mi NW of Los Volcanes, 18 Sep 1968, Carman & Giannasi 68-114 (IA, TEX); ca. 9 mi W of Los Volcanes, along dirt road to Puerto Vallarta, 14 Sep 1966, Melchert, Sorensen & Crawford 6389 (IA, TEX).

Sherff (1964) positioned this relatively delicate, isolated, Jalisco endemic in *Cosmos diversifolius* largely on the basis of its *scapose* habit. Field and



Figure 1. Heads of *Cosmos diversifolius* (upper view): var. *dahhoides* (left); var. *diversifolius* (right). Sizes of structures given in text.



Figure 2. Heads of *Cosmos diversifolius* (underview): var. *diversifolius* (left); var. *dahlioides* (right). Sizes of structures given in text.



Figure 3. Unopened buds of *Cosmos diversifolius*: var. *dahlioides* (left); var. *diversifolius* (right). Sizes of structures given in text.

greenhouse studies, however, have shown *C. deficiens* to be one of the most distinctive elements of the tuber bearing *Cosmos* species. Though generally similar in habit to certain scapose forms of *C. diversifolius* (particularly the diminutive var. *pumilus* Sherff), these two species differ markedly in leaf shape and dissection patterns, size and shape of outer involucre bracts, fruit size, and distribution.

Leaf dissection: as indicated by its epithet, the leaves of *Cosmos diversifolius* are highly variable in form, varying more or less continuously from undivided with subspatulate or lance ovate blades to very deeply pinnate. When pinnate in form, their mostly entire segments, though well separated, are connected by a broadly winged rachis (at least above, the segments varying in shape from lanceolate to oblong, lance obovate or even subspatulate). In sharp contrast, *C. deficiens* has distinctive pinnate-pinnatifid or (less frequently) bipinnate leaves with (3)5(7) primary segments that are well separated on a very narrow (unwinged) rachis (Figures 4 & 5). As shown, the primary segments each typically bear ca. 5 very large forward pointing teeth (the lowermost may be bipinnately dissected); the very narrow, unwinged (rachislike) petiole is roughly half the length of the entire leaf; and, regardless of leaf size, the highly dissected blade is clearly narrowly triangular in overall outline. This leaf type is unique among species of *Cosmos*.

Outer involucre bracts: regardless of their habit and/or leaf shape (plants scapose to leafy stemmed, the leaves pinnate or undivided), *Cosmos diversifolius* is easily recognized by its long peduncled, usually solitary heads, which are subtended by distinctive thick, subfoliose outer involucre bracts which are (6)7-12 mm long, 3-5(7) mm wide, and marked with 6-16 prominent (sometimes interrupted) black veins (Figure 3). Indeed, due to their foliose nature, they often overlap laterally, particularly in bud (the enclosed unopened capitulum sometimes being nearly hidden). *Cosmos deficiens*, on the other hand, has relatively inconspicuous, well separated, narrowly linear outer involucre bracts, these only ca. 5 mm long and 1 mm wide.

Achenes: though similar in shape to *Cosmos diversifolius* (both taxa have linear fusiform bodies without tapered apical beaks - a shape common among tuberous *Cosmos*), those of *C. deficiens* are much smaller, i.e., 6.0-10.5 mm long and either exaristate or with 2 very short, easily broken, cusplike awns (vs. achenes 10-18 mm long with 2 or 3 stout, unequal awns 2.0-3.5 mm).

Distribution: *Cosmos diversifolius* is relatively widespread, occurring from Chiapas northwestward into México State and San Luis Potosí, whereas *C. deficiens* is restricted to a very small area in southwestern Jalisco (between Los Volcanes and Mascota).

The phyletic affinities of *Cosmos deficiens* appear to be with *C. schaffneri* Sherff, a much larger but subscapose species from southwestern México State, the leaves of which show basically the same dissection pattern seen in *C. deficiens*.



Figure 4. *Cosmos deficiens*, some basal leaves removed for clarity.



Figure 5. Individual leaves of *Cosmos deficiens*.

Cosmos landii Sherff var. *achalconensis* Melchert, var. nov. TYPE: MÉXICO. Jalisco: route 15, ca. 5 mi W of Guadalajara city limits; region of low, open, wooded foothills with broad leaved oak and scattered pine; plants among boulders in gullies and on slopes, fairly abundant, but most not yet flowering; rays 5, white with a pink tinge; 7 Sep 1966, T. Melchert, P. Sorensen & D. Crawford 6340 (HOLOTYPE: TEX!; Isotypes: IA!, MEXU!).

C. landii Sherff var. *landii* similis sed floribus radii ligulis albis (vs. lutescentibus) ac 17-19 mm longis 14-15 mm latisque et caulibus mediis infernisque glabris vel sparsim hispidulis trichomatibus minutis (vs. omnino minute atque dense hispidulis) differt.

ADDITIONAL SPECIMENS EXAMINED: MÉXICO. Jalisco: route 15, ca. 14 mi W of Guadalajara, between kms 700-701, pink rayed perennials growing along highway, 12 Aug 1968, Carman 68-69 (IA); route 15, ca. 5 mi W of Guadalajara (between kms 692 and 693), plants in dry, grass covered areas along road, rays light lavender, 20 Sep 1968, Carman & Giannasi 68-121 (IA).

Cosmos landii Sherff (a rhizomatous species of section *Mesinenia*) is the only perennial *Cosmos* species with yellow rays, the pale lemon yellow ligules resulting from the presence of a set of chalcones found in the yellow disc florets of these and all other *Cosmos* species (butein and isoliquiritigenin glycosides, [Melchert, unpubl.]). Typical (i.e., yellow rayed) *C. landii* is known only from barrancas to the immediate N of Guadalajara. The new varietal epithet calls attention to the white to pink rayed phase of this taxon occurring in open, broad leaved oak woodlands ca. 5-15 mi W of Guadalajara (all collections along route 15). Viewed phylogenetically, var. *achalconensis* ($n=22$) is essentially a rather lanky, large headed, tetraploid derivative of *C. intercedens*, a white to pink rayed diploid ($n=11$) from southwestern Jalisco and adjacent Nayarit (the Los Volcanes and Barranca del Oro areas, respectively); while var. *landii*, in turn, is probably a yellow rayed (i.e., chalcone bearing) derivative of var. *achalconensis*. Since the varieties *landii* and *achalconensis* proved to be completely interfertile (Melchert, unpubl.), I have included both in the single tetraploid species, *C. landii*.

Cosmos sessilis Sherff var. *stellatus* (Sherff) Melchert, comb. nov. BASIONYM: *Cosmos stellatus* Sherff, Brittonia 16:70-71. 1964. MÉXICO. Michoacán: abundant on high ridges, flowers dark purplish red, in pine forest on precipitous slopes, alt. 2000-2100 m, cloud forest area locally called "Cerritos de Agua," ca. 3 mi below the lumber camp at Dos Aguas, nearly W of Aguililla, ca. 18° 45' N 102° 56' W, 15 Sep 1958, McVaugh 17878 (HOLOTYPE: MICH!; Isotypes: F-photograph no. 51426!).

ADDITIONAL SPECIMENS EXAMINED (other than the type): MÉXICO. Michoacán: road from Apatzingan to Dos Aguas, ca. 2 mi E of Dos Aguas, 22 Sep 1968, *Carman & Giannasi 68-123* (IA, TEX).

Cosmos sessilis Sherff and *C. stellatus* Sherff were both described (Sherff 1964) from a single collection each. Commenting on *C. sessilis*, Sherff stated that this species appears closest to *C. stellatus*, but is readily distinguished by its "larger, greener leaves, these in pairs not at all suggesting stars: its heads discoid, not beautifully radiate with dark-purplish-red rays; and its ovaries exaristate, not biaristate with retrorsely barbellate aristae." Subsequent studies of *C. sessilis* at the type locality (Melchert 1967) revealed the discoid nature of the type specimen to be an artifact of its collection late in the flowering season. At early anthesis, *C. sessilis* invariably has 8, black sanguineous rays per head that are virtually identical to those of *C. stellatus* (no exceptions); these, however, are rather delicate and soon falling (plants in later stages of anthesis either had fewer rays or were entirely discoid). Likewise, at early anthesis, each of the disc floret ovaries were found to bear 2 short (ca. 2 mm long), smooth or retrorsely barbed awns that usually dehisce during fruit development (mature achenes, which were unknown to Sherff, are either exaristate or bear 2 minute teeth at their apices). Moreover, a recent chromosome count obtained from topotypic material of *C. stellatus* (*Carman & Giannasi 68-123*, $n=12$ [Melchert, unpubl.]) shows this species to have the same number reported for *C. sessilis* ($n=12$ [Melchert 1967]). In short, these taxa are exceedingly similar. The only consistent difference between them when grown in the University of Iowa greenhouses was found to be a relatively minor one in the dissection pattern of their sessile leaves, the ultimate segments of var. *sessilis* being (2.5)3.0-6.0 mm wide, the larger segments linear oblong and notably expanded terminally (vs. mostly narrowly linear and 1.0-3.0(4.0) mm wide in var. *stellatus*; cf. Figures 2 & 4, [Melchert 1967]).

Given all their similarities, it seems likely that *Cosmos stellatus* and *C. sessilis* may ultimately prove to be but forms of a single variable species. Nonetheless, since the populations concerned are well isolated geographically (*C. stellatus* near Dos Aguas in SW Michoacán and *C. sessilis* near Los Volcanes in SW Jalisco), and each has slightly different leaf morphologies, for now I prefer to recognize them at the varietal level.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis and to him and B.L. Turner for reviewing the manuscript. N.S.F. grants GB-3851 and GB-6684X supported the field work.

LITERATURE CITED

- Melchert, T.E. 1967. Systematic studies in the Coreopsidinae (Compositae): New *Cosmos* from Mexico. *Sida* 3(3):170-176.
- . 1968. Systematic studies in the Coreopsidinae: cytotaxonomy of Mexican and Guatemalan *Cosmos*. *Amer. J. Bot.* 55:345-353.
- Sherff, E.E. 1932. Revision of the genus *Cosmos*. *Field Mus. Nat. Hist., Bot. Ser.* 8:401-447.
- . 1955. *Cosmos*, in *North Amer. Fl.*, Ser. II, 130-146.
- . 1964. Some new or otherwise noteworthy Coreopsidinae from Mexico. *Brittonia* 16:58-73.