



## A new species of *Dichromanthus* (Orchidaceae, Spiranthinae) from Oaxaca, Mexico

### Una especie nueva de *Dichromanthus* (Orchidaceae, Spiranthinae) de Oaxaca, México

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**Abstract.** *Dichromanthus yucundaa*, a new orchid species from the Mixteca Alta region of the Sierra Madre del Sur in Oaxaca, Mexico, is described and illustrated. It is distinguished from *D. cinnabarinus*, the most similar species, by the more compact plants, glabrous inflorescence, prominent, broadly ovate, glabrous floral bracts which are abaxially glaucous, sparsely and minutely glandular-pubescent sepals (merely papillose near the apex), short column foot, viscidium sheathing the apex of the rostellum and without a retrorse prominence, and rostellum remnant stiff and pointed.

Key words: *Dichromanthus yucundaa*, endemism, Mixteca Alta region, Oaxaca, rostellum, rostellum remnant, viscidium.

**Resumen.** Se describe e ilustra a *Dichromanthus yucundaa*, especie nueva de orquídea de la región de la mixteca alta de la sierra Madre del Sur en Oaxaca, México. Se distingue de *D. cinnabarinus*, la especie más similar, por las plantas más compactas, la inflorescencia glabra, las brácteas florales prominentes, ampliamente ovadas, glabras, abaxialmente glaucas, los sépalos diminuta y esparcidamente glandular-pubescentes (diminutamente papilosos cerca del ápice), el pie de columna corto, el viscidio envainando el ápice del rostelo y careciendo de una prominencia retrorsa y el remanente rostelar rígido y aguzado.

Palabras clave: *Dichromanthus yucundaa*, endemismo, región de la mixteca alta, Oaxaca, remanente rostelar, rostelo, viscidio.

### Introduction

The genus *Dichromanthus* Garay was originally proposed to include a single species, *D. cinnabarinus*, which had been placed by other taxonomists either in the catch-all genus *Spiranthes* Rich. s.l. (e.g. Williams, 1951; Ames and Correll, 1952; McVaugh, 1985) or in *Stenorrhynchos* Rich. (Lindley, 1840; Schlechter, 1920). *Dichromanthus* was distinguished from other genera in Spiranthinae mainly by its “soft, pliable, linear oblong, blunt rostellum” (Garay 1982), or more correctly rostellum remnant, i.e., what remains of the rostellum after the removal of the viscidium. In contrast, *Spiranthes* s.str. and *Stenorrhynchos* s.str. have bifid and stiffly pointed rostellum remnants, respectively (Garay, 1982; Greenwood, 1982). Balogh and Greenwood (1982) and Greenwood (1982) also noted the distinctive rostellum of ‘*Spiranthes*’ *cinnabarina*, describing its viscidium as “plug-like” in reference to the retrorse extension or “tail”

that fits within the “tubular-tipped” rostellum remnant, in contrast with the sheathing viscidium that encloses the “bristle-like” rostellum remnant of *Stenorrhynchos*. Balogh and Greenwood (1982) also proposed a new genus for ‘*S.*’ *cinnabarina*, *Cutsis* Burns-Bal., E. W. Greenw. et R. González, but Garay’s *Dichromanthus* had nomenclatural priority.

More recently, there have been 2 opposing views concerning the delimitation of *Dichromanthus*. On the one hand, Salazar et al. (2002, 2003) and Salazar (2003) adopted a broader concept of the genus to include 2 additional species, namely *D. aurantiacus* (La Llave et Lex.) Salazar et Soto Arenas and *D. michuacanus* (La Llave et Lex.) Salazar et Soto Arenas, based on their many vegetative, reproductive, and genetic similarities to *D. cinnabarinus* (see also Figueroa et al., 2008). On the other hand, taxonomists that prefer to base their groupings solely on floral (mostly rostellum) characters, such as Szlachetko et al. (2005), have instead maintained *Dichromanthus* as a monospecific genus and placed the other 2 species in the genus *Stenorrhynchos*, which according to molecular

phylogenetic studies makes the latter polyphyletic (Salazar et al., 2003).

In this work we follow the broader generic concept of *Dichromanthus* of Salazar et al. (2002; 2003), according to which the genus consists of 3 hitherto described species and is distributed in the highlands of southern USA (Arizona and Texas), most major mountain ranges of Mexico, as well as Guatemala, El Salvador, and Honduras (Salazar, 2003). We describe herein a further species, discovered in the course of botanical exploration conducted recently in the Mixteca Alta region of the Sierra Madre del Sur, state of Oaxaca, Mexico.

### Description

*Dichromanthus yucundaa* Salazar et García-Mend., n. sp. (Figs. 1, 2)

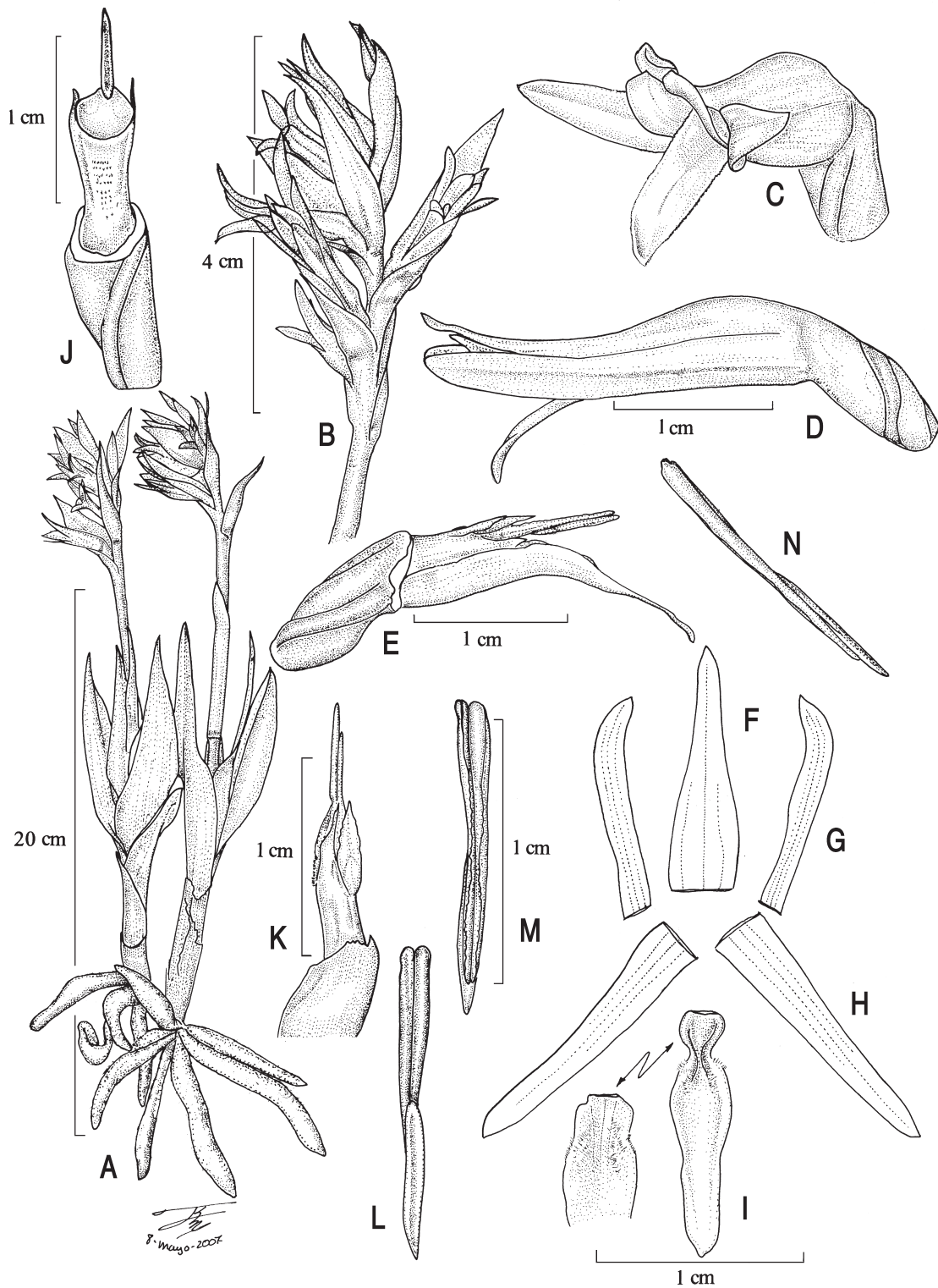
Holotype: MEXICO. Oaxaca: Distrito Teposcolula, municipio San Pedro y San Pablo Teposcolula, ladera noroeste del Cerro Pueblo Viejo de Teposcolula Yucunda, 2286 m elev., collected 28 Apr. 2007, pressed in cultivation 14 May 2007, A. García-Mendoza et S. Franco 8744 (MEXU!).

*Dichromantho cinnabarino* (La Llave et Lex.) Garay similis, sed statura minore, inflorescentia glabra, bracteis floralibus prominentibus, late ovatis, glabris, extus glaucis, sepalis minute sparseque glandulari-pubescentibus ad apicem papilloso, pede columnae breviorae, viscidio vaginanti sine prominentia retrorsa et residuo rostellii rigido acutissimo differt.

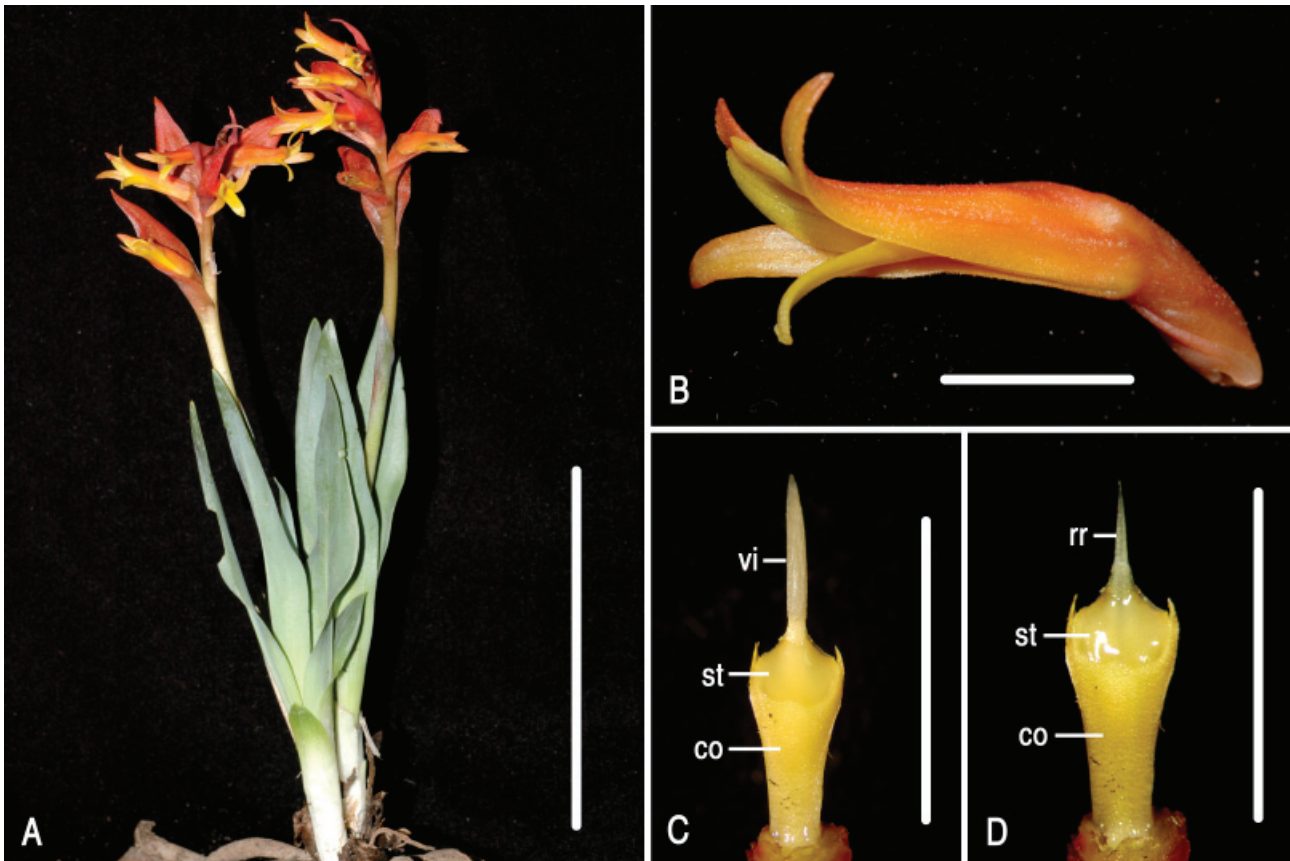
Terrestrial, acaulescent herb 20-30 cm in height above ground, including the inflorescence. Roots fasciculate, terete, glabrous or with occasional simple trichomes, 4-15 cm long, 4-7 mm in diameter. Leaves 3-5, forming a basal rosette, present at flowering time, deciduous, elliptic-oblong, acute at apex, tapering at base into a broad, sheathing petiole, glaucous, 11.5-15 cm long, 1.2-3.2 cm wide. Inflorescence arising from the center of the rosette of leaves, racemose, glabrous, 20-30 cm long; scape terete, partially covered by 2 strict tubular, acute bracts; raceme dense, subsecund, 6.5-15.5 cm long, with 7-17 flowers, most of them open at the same time. Floral bracts prominent, about as long as to conspicuously longer than the flowers, bright red, abaxially glaucous, loosely concave, ovate, acuminate, 2.5-4.5 cm long. Flowers resupinate, odorless, fleshy, slightly ascending to nearly horizontal; ovary and dorsal sepal orange-red, lateral sepals orange-yellow with red suffusion, especially along the midvein; petals and labellum yellow with whitish base; column dorsally reddish-white, yellow ventrally. Sepals

erect on their proximal two-thirds forming a strong floral tube together with the other floral segments, flaring on the distal one-third; dorsal sepal adherent to the lateral sepals and petals on its proximal two-thirds, abaxially minutely and sparsely glandular-pubescent, most noticeably so along the margins, with the trichomes becoming papillae near the apex, concave, triangular-lanceolate, acute, with a slight broadening shortly below the apex, 22-24 mm long, 6-7 mm wide; lateral sepals free from each other but adherent to the petals on their proximal two-thirds, with pubescence as in the dorsal sepal, slightly concave, keeled dorsally, obliquely triangular, acute, unequally broadened near the apex, 24-25 mm long, 3-4.5 mm wide. Petals erect on their proximal two-thirds, flaring above, sparsely glandular-ciliate, the trichomes reduced to papillae near the apex, slightly concave, linear on proximal three-fourths, falcate above, subacute, ca. 25 mm long, 2.5 mm wide. Labellum sessile, erect and parallel to the column below the middle, slightly arching downwards above, concave-channeled on the proximal two-thirds, more or less flat above, abaxially papillose throughout, with the papillae elongated and finger-like on the external part of the nectary, smaller and conical elsewhere (absent on the distal internal one-third), margins ciliate; basal one-fourth conduplicate-channeled, forming a narrow nectary in which nectar accumulates as droplets, with slightly thickened, glabrous nectar glands inside the margins near the base; when flattened lanceolate-oblong, acute, with the apical margins slightly upturned, ca. 20 mm long, 5.5 mm wide. Column clavate, somewhat dorsiventrally compressed, semiterete, flat and glabrous on proximal half of adaxial surface, slightly convex and papillose above, ca. 11 mm long, 3.5 mm wide, provided at base with a column foot obliquely decurrent at the apex of the ovary, the foot forming a steep obtuse angle with the column proper, 2-2.5 mm long. Anther dorsal, triangular-oblong, acute, imperfectly 4-celled, sessile, with fleshy connective. Pollinarium formed by 2 acicular, deeply cleft, creamy-white granular pollinia attached to the dorsal surface of the linear-ligulate, grey viscidium; whole pollinarium ca. 11 mm long, 1 mm wide. Rostellum narrowly triangular, its apex covered by the viscidium like a sheath; rostellum remnant stiff, narrowly pointed, ca. 3.3 mm long. Stigma entire, transversely elliptic, shiny and somewhat sticky at anthesis. Ovary ascending, subsessile, obliquely obpyramidal-obovoid, twisted, with 3 ribbon-like ribs, sparsely papillose with few, rather short glandular trichomes near the apex, 5-12.5 mm long, 3-4.5 mm in diameter near the apex. Developing capsules ascending, ellipsoid, ca. 15 mm long, 5 mm in diameter (not seen mature).

*Additional specimens examined.* MEXICO. Oaxaca: Distrito Teposcolula, municipio San Pedro y San Pablo Teposcolula,



**Figure 1.** *Dichromanthus yucundaa*. A, habit. B, inflorescence. C, flower, oblique view from side. D, flower from side. E, flower with sepals and petals removed. F, dorsal sepal. G, petal. H, lateral sepal. I, labellum, with detail of spread-out base. J, column and ovary from below. K, column from side. L, pollinarium from below. M, pollinarium from above. N, pollinarium from side. Drawn by Rolando Jiménez Machorro from *García-Mendoza et Franco 8744*.



**Figure 2.** *Dichromanthus yucundaa*. A, flowering plants. B, flower from side. C, column from below with viscidium in place sheathing the apex of the rostellum. D, column from below after removal of the viscidium, showing the stiff, pointed rostellum remnant. Abbreviations: co = column; rr = rostellum remnant; st = stigma; vi = viscidium. Scale bars: A = 10 cm; B-D = 1 cm. Photographs by G. A. Salazar from *García-Mendoza et Franco 8744*.

al este de la iglesia de Pueblo Viejo de Teposcolula Yucunda, 2423 m elev., 17 Sep. 2005, *A. García-Mendoza, S. Franco et F. Martínez 7962* (MEXU!).

*Other records.* MEXICO. Oaxaca: municipio de San Bartolo Soyaltepec, Cerro Yucundú [sic], cerca de Unión Reforma, Aug. 2007, *O. Santiago s.n.* (photographs of plant in situ and close-up of old inflorescence, MEXU!).

*Etymology.* The specific epithet refers to the Cerro Viejo de Teposcolula Yucunda, where the new species was first discovered. The Mixtec word *yucundaa* may be translated as “on the plain of the mountain”.

*Distribution and habitat.* *Dichromanthus yucundaa* is known only from 2 locations in the Mixteca Alta region of the Sierra Madre del Sur, in northeastern Oaxaca, Mexico. It lives in soil pockets on limestone rocky ground in open, disturbed areas originally covered by pine-oak forest at 2280–2400 m elevation. At the type locality, the original vegetation consists of a *Pinus pseudostrobus* Lindl.-*Quercus acutifolia* Née forest and the plants of *D. yucundaa* were found growing with other herbs such

as *Sprekelia formosissima* (L.) Herb. (Amarillydaceae), *Cyperus spectabilis* Link (Cyperaceae), *Lycurus phleoides* Kunth (Poaceae), and *Ophioglossum engelmannii* Prantl (Ophioglossaceae), in addition to at least 19 additional orchid species. These include the epiphytes *Epidendrum lignosum* La Llave et Lex., *Laelia albida* Lindl., *L. furfuracea* Lindl., *Prosthechea concolor* (La Llave et Lex.) W. E.Higgins and *P. aff. citrina* (La Llave et Lex.) W. E.Higgins, and the terrestrials *Aulosepalum pyramidale* (Lindl.) M. A. Dix et M. W. Dix, *Bletia* sp., *Corallorhiza wisteriana* Conrad, *Cypripedium molle* Lindl., *Deiregyne confusa* Garay, *Govenia capitata* Lindl., *G. lagenophora* Lindl., *Habenaria subauriculata* B. L. Rob. et Greenm., *Hexalectris grandiflora* (A. Rich. et Galeotti) L. O. Williams, *Mesadenus polyanthus* (Rchb.f.) Schltr., *Ocampo mexicana* A. Rich. et Galeotti, *Ponthieva schaffneri* (Rchb.f.) E. W. Greenw., *Sarcoglottis schaffneri* (Rchb.f.) Ames, and *Schiedeella llaveana* (Lindl.) Schltr. Flowering occurs in May and developing fruits were recorded in September.

**Discussion**

This species is similar in overall vegetative and floral structure to *D. cinnabarinus*, the type species of *Dichromanthus*, but differs from it in the compact plants barely reaching 20-30 cm in height, the proportionately shorter leaves and inflorescences, the glabrous inflorescence with comparatively few (7-17) flowers, the prominent, slightly concave, broadly ovate floral bracts that are glabrous throughout and glaucous on the abaxial surface, the sepals minutely and sparsely glandular-pubescent with papillose apices, the short column foot not long-decurrent on the apex of the ovary, the sheathing viscidium without a retrorse prominence inserted in the rostellum, and the stiff, pointed rostellum remnant. The last 2 attributes are particularly critical, since *D. cinnabarinus* is unique in Spiranthinae (sensu Salazar et al., 2003; Salazar, 2003) in that the viscidium, instead of forming a sheath covering the apex of the rostellum, is removed as a whole by the pollinator, leaving at the apex of the more or less blunt rostellum remnant a membranaceous “pouch” or cavity in which its retrorse extension or tail was hidden (Balogh and Greenwood, 1982; Greenwood, 1982; Salazar, 2003). Since the features of the rostellum have traditionally been considered of prime importance for generic delimitation in Spiranthinae (e.g., Schlechter, 1920; Balogh, 1982; Garay, 1982; Szlachetko et al., 2005), one-character taxonomists may disagree with our generic placement of the new species. Using the key to the genera of Mesoamerican

“Stenorrhynchidinae” (a polyphyletic segregate of Spiranthinae considered here as its synonym; Salazar et al., 2003) in Szlachetko et al. (2005), *D. yucundaa* keys out to *Coccineorchis* Schltr., another member of Spiranthinae with showily colored, tubular flowers and stiffly pointed rostellar remnant which is not closely related neither to *Dichromanthus* nor to *Stenorrhynchos* (see Salazar et al., 2003), unless one decides to call the leaves “cauline” (i.e. spaced along the lower part of the scape) instead of rosulate, in which case it keys out to *Stenorrhynchos*. However, *D. yucundaa* shares many features with *D. aurantiacus*, *D. cinnabarinus*, and *D. michuacanus*, and its likeness in floral structure and color to *Stenorrhynchos* and *Coccineorchis* likely is the result of convergence for hummingbird pollination (cf. van der Pijl and Dodson, 1966). The differences between *D. yucundaa* and the other species of *Dichromanthus* are summarized in Table 1.

It is worth noting that, in spite of the considerable collecting efforts conducted in Oaxaca during the last 3 decades (reviewed in García-Mendoza, 2004; Soto and Salazar, 2004) and of its showy inflorescence, this species appears not to have been collected previously. Therefore it could represent a true narrow endemic and not a widespread, overlooked species. There are other well-documented cases of orchid endemism in the Mixtec region and the adjacent arid valleys of Oaxaca and of Tehuacán-Cuicatlán, including *Barkeria melanocaulon* A. Rich. et Galeotti, *Cypripedium molle*, *Habenaria subauriculata*, *Laleoglossum thysanochilum* (B. L. Rob.

**Table 1.** Comparison of the four known species of *Dichromanthus*

Feature	<i>D. aurantiacus</i>	<i>D. cinnabarinus</i>	<i>D. michuacanus</i>	<i>D. yucundaa</i>
Plant	50-120 cm tall	35-120 cm tall	35-100 cm tall	20-30 cm tall
Leaves	cauline	cauline or rosulate	cauline or rosulate	rosulate
Flower color	orange throughout	sepals scarlet red, internally orange, petals and labellum yellow with reddish apices	white to lemon yellow with dark green or brownish veins	sepals orange red, petals and labellum yellow
Flower indument	ovary and abaxial surface of sepals densely and prominently pubescent	ovary and abaxial surface of sepals densely and prominently pubescent	ovary and abaxial surface of sepals densely and prominently pubescent	ovary and abaxial surface of sepals papillose to sparsely and minutely pubescent
Floral bracts	pubescent, orange	pubescent, red	pubescent to glabrous, green but marcescent at anthesis	glabrous, red, abaxially glaucous
Lip contour	lanceolate-pandurate	lanceolate-pandurate	ovate-pandurate	lanceolate-oblong
Rostellum remnant shape	sharply pointed	broadly notched, pouch like	sharply pointed	sharply pointed
Viscidium	sheathing the rostellum remnant	with retrorse extension originally inserted in the pouch-like rostellum remnant	sheathing the rostellum remnant	sheathing the rostellum remnant

et Greenm.) Salazar, and *Dichromanthus cinnabarinus* subsp. *galeottianus* (Schltr.) Soto Arenas et Salazar (Soto and Salazar, 2004). As in the case of *D. yucundaa*, all these species appear to be largely restricted to areas with an extensive exposure of limestone.

Both localities where *D. yucundaa* has been found are affected by considerable anthropogenic disturbance, mainly in the form of clearing of the forest and cattle grazing. Likewise, the other 3 species of *Dichromanthus* are often found in disturbed or marginal habitats, such as induced grasslands and roadside banks, in areas dominated by *Pinus-Quercus* forest, tropical deciduous forest or xerophilous scrub, often on rocky terrain such as basaltic or limestone rocky fields (Luer, 1975; Salazar, 2003; Coleman, 2005; Hågsater et al., 2005; Salazar et al., 2006). However, *D. aurantiacus*, *D. cinnabarinus*, and *D. michuacanus* are all widespread and usually form large populations, whereas *D. yucundaa* appears to be rather localized and, at least at the type locality, the population consists of a few scattered individuals (A. García-Mendoza, pers. obs.). Given its restricted distribution and sparse, small populations, *D. yucundaa* might be considered as a rare species, although further field studies are required to ascertain its conservation status.

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