

# A new arboreal *Chamaecrista* (Fabaceae) and first record of the section *Apoucouita* for the Inter Andean Valleys of Colombia

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**Abstract:** A new species of *Chamaecrista* sect. *Apoucouita* (Caesalpinioideae, Fabaceae) from the Middle Magdalena Valley and Bajo Cauca region in the department of Antioquia, Colombia is described and illustrated. *Chamaecrista almanegra* differs from morphologically similar species mainly by its leaves with 4 to 6 pairs of leaflets (up to 8 pairs only in juvenile individuals), these remarkably falcate, wider in the acroscopic half and with secondary veins joined by an intramarginal vein at the proximal portion of the leaflet and becoming brochidodromous toward the distal portion, as well as anthers with indumentum on the entire surface. Notes about the geographical distribution, habitat and conservation status of the new species are presented, along with a key for the species of *Chamaecrista* sect. *Apoucouita* known for Colombia. This constitutes the first record of the section for the Inter Andean Valleys of the northern Andes, thus expanding its distributional range and potentially generating new hypotheses for future systematic and biogeographic studies in the genus.

**Keywords:** Biodiversity, Cassieae, endangered species, endemic species, Leguminosae, timber species.

**Resumen:** Se describe e ilustra una nueva especie de *Chamaecrista* sect. *Apoucouita* (Caesalpinioideae, Fabaceae) del Valle del Magdalena Medio y la región del Bajo Cauca en el departamento de Antioquia, Colombia. *Chamaecrista almanegra* se diferencia de las especies morfológicamente similares principalmente por sus hojas con 4 a 6 pares de folíolos (hasta 8 pares solo en individuos juveniles), éstos notablemente falcados, más anchos en la mitad acroscópica y con las venas secundarias unidas por una vena intramarginal en la porción proximal del folíolo, volviéndose broquidódromas hacia la porción distal, así como, por sus anteras con indumento en toda la superficie. Se presentan notas sobre la distribución geográfica, el hábitat y el estado de conservación de la nueva especie, acompañados por una clave para las especies conocidas de *Chamaecrista* sect. *Apoucouita* para Colombia. Este es el primer registro de la sección para los Valles Interandinos del norte de los Andes, ampliando su rango de distribución y generando nuevas hipótesis para futuros estudios en sistemática y biogeografía del género.

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The genus *Chamaecrista* (L.) Moench has been supported as monophyletic (Conceição et al., 2009; LPWG, 2017; Souza et al., 2021) and is one of the

most diverse genera of Caesalpinioideae, subtribe Cassiinae, with about 330 species, of which 266 occur in the Americas (Lewis et al., 2005; LPWG, 2017). Its species are herbs, subshrubs, shrubs or trees and are recognizable mainly by having extrafloral nectaries, pedicels 2-bracteolate near or

above the middle, a homomorphic androecium, anthers indumented along the sutures, and elastically dehiscent fruit (Irwin & Barneby, 1982; Souza et al., 2021).

Irwin and Barneby (1981, 1982) divided the genus into six sections based on morphology; however, Souza et al. (2021) recently reduced the number of sections to four based on both morphological and molecular evidence. The section *Apoucouita* (Benth.) H.S.Irwin & Barneby, which remains in the new classification (Souza et al., 2021), is supported as the monophyletic sister group of the remainder of *Chamaecrista* (Conceição et al., 2009; Souza et al., 2021). The section includes two series (sensu Irwin & Barneby, 1982)—*Apoucouita* (H.S.Irwin & Barneby) H.S.Irwin & Barneby and *Pteridophyllae* (H.S.Irwin & Barneby) H.S.Irwin & Barneby—and comprises 22 species distributed mainly in tropical moist forest of Amazonia, the Guianas and the Brazilian Atlantic Forest (Irwin & Rogers, 1967; Irwin & Barneby, 1977, 1982; Coutinho et al., 2016; Rando & Lima, 2020; Souza et al., 2021). Section *Apoucouita* is characterized by arborescent habit, cauliflorous or ramiflorous inflorescences, truncate or depressed inflorescence nectaries, and pendulous, relatively large fruit (Coutinho et al., 2016; Souza et al., 2021).

In Colombia, *Chamaecrista* is represented by 27 species distributed from sea level to 3100 m and occupying both dry and moist habitats (ICN, 2004; Quiñones, 2005; Neil & Merello, 2011; Gradstein, 2016; López, 2019). Four of these species belong to the sect. *Apoucouita* and are restricted to the Amazon Forest.

Recent botanical exploration revealed a new species and first record of *Chamaecrista* sect. *Apoucouita* for the Inter Andean Valleys of the northern Andes in Colombia. The new taxon is herein described and illustrated. Comments on its geographical distribution, habitat, phenology, conservation status and taxonomic affinities, as well as a key for the identification of the species of *Chamaecrista* sect. *Apoucouita* present in Colombia, are provided.

### Materials and methods

Fieldwork was conducted in the municipalities of Remedios and Zaragoza, in the department of Antioquia. Herbarium specimens were collected

and supplemented with photographs (Canon PowerShot SX60 HS), material preserved in 70% ethanol, and GPS data (Garmin eTrex Vista HCx).

Types and representative specimens of published names within *Chamaecrista*, especially those of the sect. *Apoucouita*, were studied from digital images through the Global Plants project (<http://plants.jstor.org>), respective virtual herbaria, and publications. Specimens at the herbaria COL (Digital images), HUA, JAUM, MEDEL, and UDBC (Digital images) were also studied (acronyms according to Thiers, 2016). Six collections from mature individuals of the new species and one from a juvenile individual were analyzed using a stereomicroscope (Wild Heerbrugg M3) for the taxonomic description and illustration. Flowers and fruits were described and illustrated from material preserved in 70% ethanol, rehydrated material, and photographs of fresh structures. Terminology pertaining to morphology was mainly taken from Irwin and Barneby (1982) and Coutinho et al. (2016); terms for venation and shape of laminar structures follow Ellis et al. (2009), those for indumentum follow Hewson (2019).

Following Barneby and Grimes (1996), in the description of leaflets the terms “basiscopic” and “acroscopic” refer to the halves of the leaflet blade longitudinally divided by the midvein and respectively oriented toward the base (i.e., the petiole) or apex of the leaf to which the leaflet belongs. These terms were alternatively named “proximal side” and “distal side” by Irwin and Barneby (1982).

The distribution map was made using Arcgis 10.5, and the conservation status was evaluated according to criteria of IUCN V 3.1 (IUCN, 2012) and assessed by the R package “ConR” (Dauby, 2019; Protected Planet, 2019; R Core Team, 2019).

***Chamaecrista almanegra*** A.M.Trujillo, Londoño-Ech. & Idárraga, **sp. nov.**—Type: Colombia. Antioquia: Mun. Zaragoza, vereda San Antonio y La Arenosa, alrededores de la mina La Valeria, 7°26'35.50"N, 74°49'16.90"W, 126 m, 16 Dec 2018 [fl], A. M. Trujillo & Y. Londoño 111 (holotype: HUA [!]; isotypes: COL [!], JAUM [!]). (Figs. 1, 2 & 3.)

**Diagnosis:** *Chamaecrista almanegra* differs from morphologically similar *Chamaecrista hymenaeifolia* (Benth.)



FIG. 1. Holotype of *Chamaecrista almanegra*.

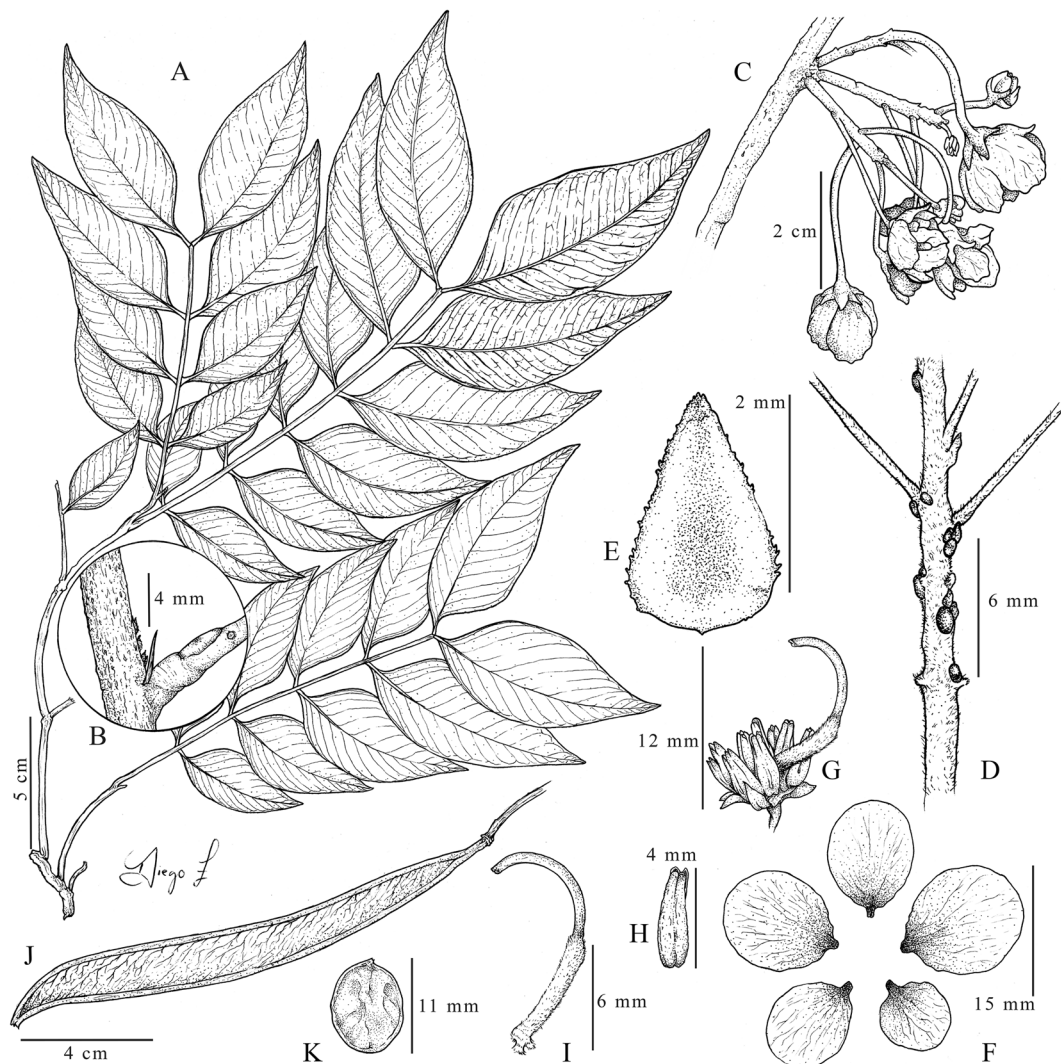


FIG. 2. *Chamaecrista almanegra*. A. Branch. B. Vegetative buds, stipule, petiole nectaries and abscission scar of leaflet. C. Inflorescence. D. Inflorescence nectaries. E. Sepal. F. Corolla. G. Androecium and gynoecium. H. Anther. I. Pistil. J. Fruit. K. Seed. [A from the holotype; B–C from Londoño & Trujillo 294; D–I from Londoño & Trujillo 295; J–K from Trujillo & Londoño 112. Drawn by Diego Armando Zapata, HUA illustrator.]

H.S.Irwin & Barneby by its leaves with 4–6 (–8) pairs of leaflets (vs. 1–2 [–3] pairs of leaflets), petiolule 1.6–2.8 mm long (vs. 3–6 mm long), leaflets wider in the acroscopic half (vs. wider in the basiscopic half or occasionally the halves equal), concolorous (vs. paler dull below), secondary veins joined by an intramarginal vein in the proximal portion of the leaflet, becoming brochidodromous in the distal portion (vs. craspedodromous-brochidodromous throughout the leaflet), a strictly marginal vein absent (vs. present), and anthers 3.4–4.4 mm long (vs. 4–4.6 mm long).

*Trees* up to 18 m tall, branchlets slightly pendulous, puberulent or glabrescent, trichomes ca.

0.5 mm long, densely or sparsely lenticellate; stipules (1–) 3–7 mm long, setose, flattened ventrally, glabrous to pubescent, deciduous; axillary buds 1 or 3–4 (–5) and in serial supra-axillary, pubescent, trichomes ca. 0.5 mm long. *Leaves* (5.1–) 6.5–15.7 cm long (up to 19.1 cm long in juvenile individuals), with 4–6 pairs of leaflets (up to 8 pairs in juvenile individuals), distichous, proximal leaflets early deciduous, distal leaflets longer than the others, young leaves reddish in vivo; petiole 0.7–1.8 cm long (including

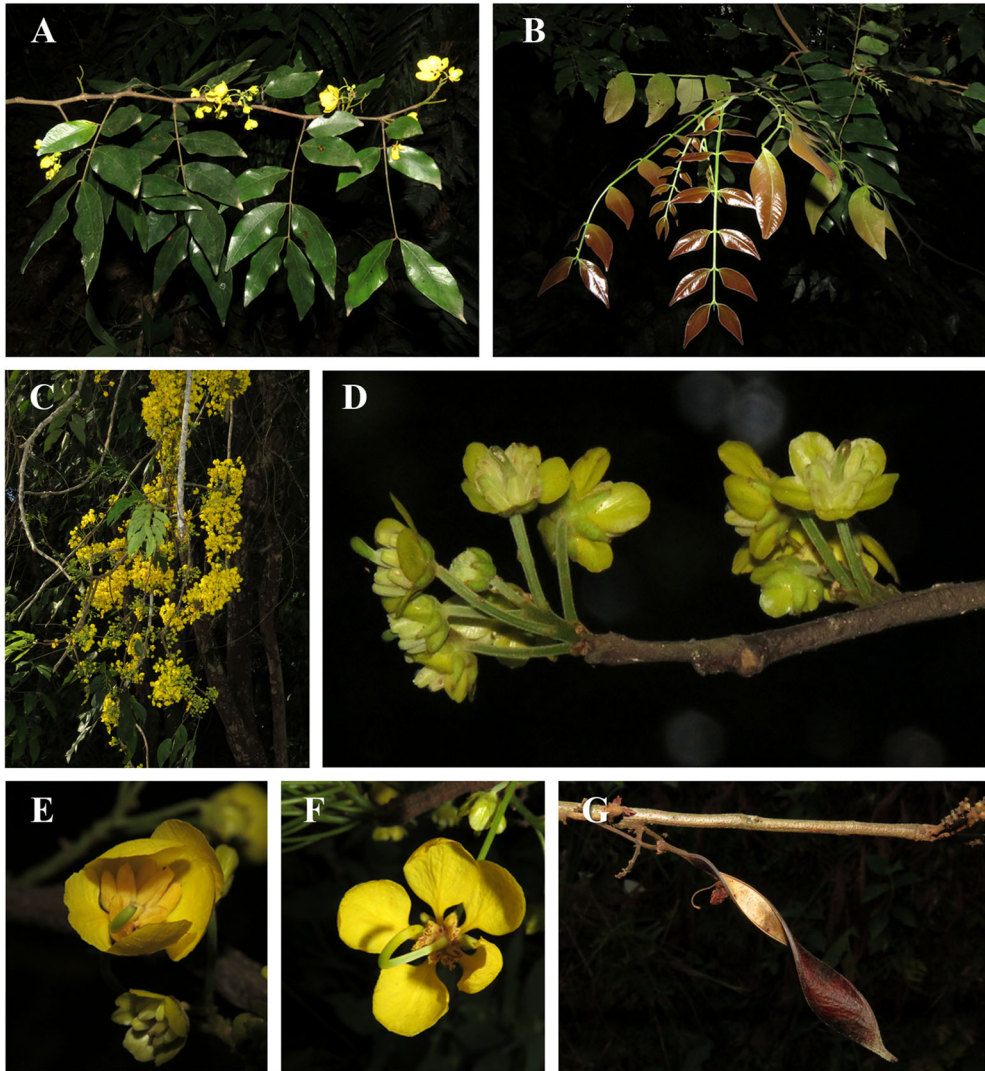


FIG. 3. *Chamaecrista almanegra*. A. Branch. B. Young leaves. C. Floriferous branch. D. Floral buds. E. Corolla aestivation. F. Flower. G. Fruit. [A–B, D–E from Londoño & Trujillo 294; C, F from Londoño & Trujillo 295; G from Trujillo & Londoño 112. Photos by A. M. Trujillo, edited by Ana Cristina Pareja, HUA illustrator.]

pulvinus), canaliculate adaxially, puberulent to pubescent, pulvinus wrinkled when dry; petiolar nectary 1.7–5.7 mm long, elongate, rarely rounded, convex (occasionally concave when dry), sessile, inserted between pulvinus and first pair of leaflets, sometimes immediately below first pair; rachis (4.4–) 7.2–13.6 cm long (up to 17.3 cm long in juvenile individuals), canaliculate adaxially, pubescent, sometimes mucronate, the mucro 0.2–0.6 (–1.2) cm long; rachis nectaries 0.5–1.1 mm diam, usually rounded, concave, sessile, rarely stipitate, located between distal pair of

leaflets, occasionally between other pairs; petioles 1.6–2.8 mm long, puberulous to pubescent, wrinkled when dry; leaflet blades  $3.7\text{--}10.7 \times 1.9\text{--}4.2$  cm, falcate-ovate to falcate-elliptic (–oblong), asymmetric, wider in the acroscopic half, the base acute to slightly obtuse, straight on the basiscopic half, convex (occasionally straight) on the acroscopic half, the apex acute, short-acuminate, mucronate; blade glabrous on both surfaces, concolorous; midvein curved, raised below, impressed above, scarcely pubescent at the base, sometimes glabrous; secondary veins 9–14 pairs,

ascending, prominulous in both surfaces, adjacent ones joined by an intramarginal vein in the proximal portion of the leaflet, becoming brochidodromous in the distal portion of the leaflet; tertiary veins reticulate; margin slightly revolute, ciliate, sometimes glabrous. *Racemes* 0.8–3.3 (–6.2) cm long (axis including peduncle), 8–17-flowered, sessile or pedunculated, usually ramiflorous in leafless branches, 1(–2) per bud (1–4 buds becoming floriferous), the axis pubescent; inflorescence nectaries 0.3–1 mm long, rounded or elliptic, globose or convex, subsessile to stipitate, usually inserted in the floriferous portion of the raceme, stipe ca. 0.8 mm long; bracts ca. 1 mm long, deltate or lanceolate, pubescent abaxially, scarcely pubescent adaxially, subtending pedicel, caducous or sometimes persistent, margin entire or occasionally tridentate; pedicels 1.8–5 cm long, puberulent, pubescent distally; bracteoles ca. 0.5 mm long, 2 per pedicel, ovate to elliptic, pubescent abaxially, scarcely pubescent adaxially, inserted in upper half of pedicel, margin tridentate. *Sepals* 2.4–3.6 × 1–1.7 mm, lanceolate, pubescent abaxially, scarcely pubescent adaxially, dark brown at center when dry, margin entire to tridentate, rarely regularly dentate, usually papillate. *Petals* (8.8–) 11–15.1 (–17) × 5.9–9.3 (–12) mm (cucullus smaller than others), shortly unguiculate, rounded above the claw, the base above the claw obtuse, rounded or truncate (cucullus base concave proximally and convex distally), the apex obtuse, rounded; glabrous to puberulous on veins abaxially, glabrous to sericeous on veins adaxially, yellow in vivo. *Androecium* 10-merous, the stamens subhomomorphic; filaments obsolete; anthers 3.4–4.4 × 1.2–1.8 mm, narrowly ovate, tetragonal, tomentose (more densely toward the sutures). *Gynoecium* 14.3–14.5 mm long, stipitate, stipe ca. 1 mm long, ovary 5.2–6 mm long, pubescent; style 8.3–9 mm, puberulous; stigma pubescent. *Fruit* 13.7–15.2 × 1.4–1.7 cm, narrowly oblanceolate, puberulous at base, puberulent or glabrescent on sutures, surface venulous, lignous, brown and shiny in vivo, the stipe 5–8 mm long. *Seed* 9.5–11.8 mm diam, 1.8–2.5 mm thick, rounded, flattened, smooth, olive green in vivo.

*Distribution and habitat.*—This species is endemic from Colombia, where occurs in the Magdalena River Valley biogeographic region (sensu Bernal, 2016), under equatorial monsoon climate (Am) according the Köppen-Geiger climate classification (Kottek et al., 2006), inhabiting

fragments of riparian forest at elevations between 60 and 350 m. It has been collected in the north of the department of Antioquia, in an intermediate area between the valleys of the Magdalena and Cauca rivers, on the municipalities of Remedios and Zaragoza (Fig. 4).

*Phenology.*—The species has been observed flowering in December and fruiting in December and January.

*Etymology.*—The epithet “almanegra” refers to the vernacular name given to the species at the type locality. It means “black soul” and describes the tree’s blackish wood, which is considered to be valuable and of fine quality.

*Conservation status.*—Using an R package version of “ConR” (Dauby, 2019; Protected Planet, 2019; R Core Team, 2019), this taxon is assessed as Critically Endangered (CR), on the basis of criteria B1ab (iii) + B2 of IUCN V 3.1 (IUCN, 2012). The species has an area of occupancy (AOO) of 8 km<sup>2</sup>, an extent of occurrence (EOO) of <30 km<sup>2</sup>, and has only two known subpopulations, which are isolated from each other. The subpopulations occur outside of protected areas, in fragmented habitats experiencing continuous decrease in quality and extent. One of these fragments is located inside of a mining project, less than 10 km from an urban center. The species may also be threatened by overharvesting, as the wood is commonly used locally to make furniture because of its fine quality. Together these threats highlight the need for additional research on the distribution and ecology of the new species to allow for its conservation.

*Additional specimens examined.*—**COLOMBIA.** **Antioquia:** mun. Remedios: vereda Río Negrito, 6°53′55.04″ N, 74°29′20.07″ W, 350 m, 4 Mar 2018 [st], Y. Londoño & J. Pérez; 200 (HUA); *ibid.*, 6 Apr 2018 [st], A. M. Trujillo & Y. Londoño 37 (HUA). Mun. Zaragoza: vereda San Antonio y La Arenosa, alrededores de la mina La Valeria, 7°26′39.60″ N, 74°49′49.1″ W, 60 m, 16 Dec 2018 [fl], Y. Londoño & A. M. Trujillo 294 (COL, CUV, HUA, JAUM, MO); 7°26′43.8″ N, 74°49′36.98″ W, 71 m, 16 Dec 2018 [fl], Y. Londoño & A. M. Trujillo 295 (HUA, JAUM); 7°26′38.30″ N, 74°49′50.7″ W, 109 m, 16 Dec 2018 [st], A. M. Trujillo & Y. Londoño 48 (HUA); *ibid.*, 16 Dec 2018 [fr], A. M. Trujillo & Y. Londoño 112 (COL, CUV, HUA, JAUM, MO).

This new species belongs to *Chamaecrista* sect. *Apoucouita* due to its arboreal habit, usually ramiflorous, often serial, supra-axillary inflorescences, pendulous, elongate fruit (13.7–15.2 cm long) and the presence of nectaries in leaf axes

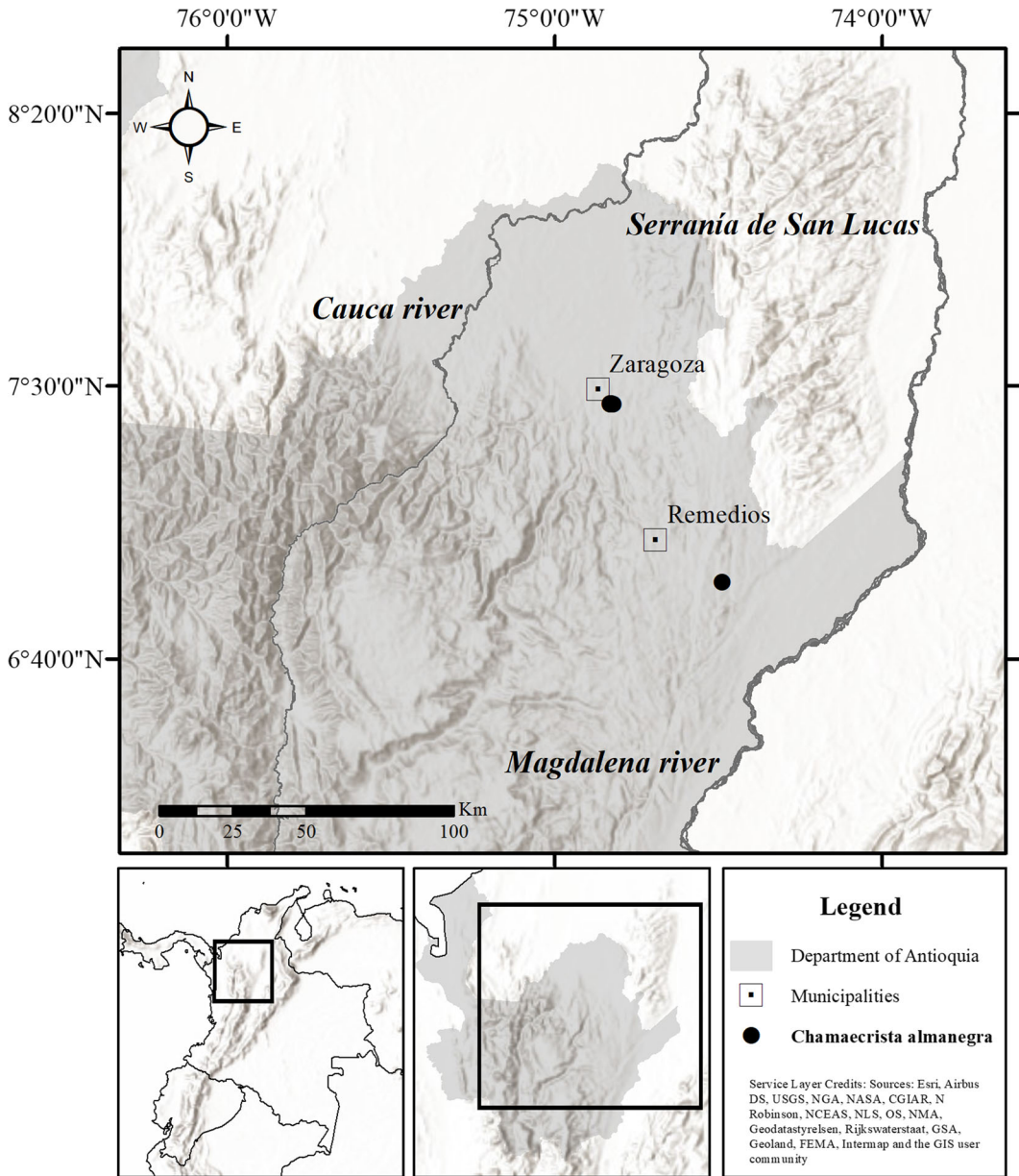


FIG. 4. Distribution of *Chamaecrista almanegra*.

and inflorescences. *Chamaecrista apoucouita* (Aubl.) H.S.Irwin & Barneby is also recorded for Colombia (although for the Amazon region) and can be similar to the new species due to the leaves sometimes with 4 pairs of leaflets, these occasionally falcate and with the blade 4–12 cm long; however, *C. almanegra* differs from it by the foliar rachis unwinged (vs. distally winged in *C. apoucouita*), the midvein curved (vs. straight

and the anthers tomentose on the entire surface (vs. glabrous).

Although *Chamaecrista ensiformis* var. *plurifoliolata* (Hoehne) H.S.Irwin & Barneby and *C. xinguensis* (Ducke) H.S.Irwin & Barneby are not recorded for Colombia, these taxa are also similar to the new species due to the number of leaflets (5–8 pairs and 6–10 pairs, respectively), position of the petiolar nectary (sometimes

contiguous to the proximal pair of leaflets or on the petiole proper respectively) and indumented anthers. However, *C. almanegra* differs from both species by the stipules setose and (1–) 3–7 mm long (vs. obsolete and not over 1 mm long), the leaflets falcate with the midvein curved (vs. mostly not falcate with the midvein straight), and the secondary veins joined by an intramarginal vein in the proximal portion of the leaflet and becoming brochidodromous toward the distal portion (vs. brochidodromous throughout). Furthermore, *C. almanegra* differs from *C. ensiformis* var. *plurifoliolata* by the combination of axillary buds solitary or 3–4 (–5) serially arranged in supra-axillary position (vs. 1–2), petiolules 1.6–2.8 mm long (vs. not over 1 mm long), petals glabrous or puberulous on veins abaxially (vs. velutinous toward the base and on veins abaxially), and pedicels 1.8–5 cm long (vs. 1–2 [–2.5] cm long). Finally, *C. almanegra* differs from *C. xinguensis* by the combination of leaves (5.1–) 6.5–15.7 cm long in mature individuals

(vs. [15–] 18–25 cm long), petioles 7–18 mm long (vs. 15–40 mm long), and pedicels 1.8–5 cm long (vs. 1.5–2.5 cm long).

The description of *C. almanegra* increases the number of registered species of *Chamaecrista* for Colombia and of sect. *Apoucouita* to 28 and 23, respectively. The new species represents the first record of the section for the inter-Andean valleys of the northern Andes, which may have important implications for future biogeographic and evolutionary studies in the genus.

Following is a key to distinguish the Colombian species of *Chamaecrista* sect. *Apoucouita*. *Chamaecrista negrensis* (H.S.Irwin) H.S.Irwin & Barneby is included in the key based on an unvouchered record for Colombia cited in López (2019). Although we did not observe any specimens of this species from the country, *C. negrensis* is expected to be found (particularly in the departments of Guainía and Vichada) since this species has been collected in neighboring areas in the state of Amazonas in Venezuela.

### Key to the species of *Chamaecrista* sect. *Apoucouita* occurring in Colombia

1. Leaves with 20 or more pairs of leaflets.....*C. adiantifolia*.
1. Leaves with 1–10 pairs of leaflets.
  2. Rachis winged at apex, midvein straight; anthers glabrous.....*C. apoucouita*.
  2. Rachis unwinged, midvein falcate; anthers indumented.
    3. Rachis terete, secondary veins of leaflets eucamptodromous in proximal portion of leaflet, becoming brochidodromous in the distal portion.....*C. negrensis*.
    3. Rachis canaliculate, secondary veins of leaflets craspedodromous-brochidodromous throughout leaflet or joined by an intramarginal vein in the proximal portion of the leaflet and becoming brochidodromous in the distal portion.
      4. Petiolule 3–6 mm long, leaves with 1–2 (–3) pairs of leaflets, leaflets wider in the basiscopic half (or the halves occasionally equal in width), paler and duller below, secondary veins craspedodromous-brochidodromous, strictly marginal secondary vein present, anthers 4–6 mm long.....*C. hymenaeifolia*.
      4. Petiolule 1.6–2.8 mm long, leaves with 4–6 (–8) pairs of leaflets, leaflets wider in the acroscopic half, concolorous, secondary veins joined by an intramarginal vein in the proximal portion of the leaflet and becoming brochidodromous toward the distal portion, strictly marginal secondary vein absent, anthers 3.4–4.4 mm long.....*C. almanegra*.

### Acknowledgments

We thank Gabriel Macea (local resident of the municipality of Zaragoza and field guide) for his help during fieldwork, Diego Armando Zapata (HUA) for the illustration, Ana Cristina Pareja (HUA) for photograph editing, Luciano Queiroz (HUEFS) for taxonomic advice and Carolina Romero (MO) and Juliana Gastaldello Rando (Universidade Federal do Oeste da Bahia) for their suggestions and editorial advice during the drafting of the manuscript. The authors also thank the staff of the herbaria of the Universidad de Antioquia (HUA) and Fundación Jardín Botánico

de Medellín (JAUM) for granting access to their collections and equipment, and for general advice.

### Declaration of competing interest

The authors declare that they have no known competing interests that could have appeared to undermine the objectivity or integrity of the work reported in this paper.



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