

## **Adiantum weatherbyanum Espinosa, an Overlooked Species from Northern Chile and *A. rodriguezii*, a New Species from Central Chile**

Authors: Prado, Jefferson, Hirai, Regina Y., Sundue, Michael A., and Testo, Weston L.

Source: American Fern Journal, 113(4) : 249-256

Published By: The American Fern Society

URL: <https://doi.org/10.1640/0002-8444-113.4.249>

---

BioOne Complete ([complete.BioOne.org](https://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](https://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## ***Adiantum weatherbyanum* Espinosa, an Overlooked Species from Northern Chile and *A. rodriguezii*, a New Species from Central Chile**

JEFFERSON PRADO\*

Instituto de Pesquisas Ambientais (IPA), Av. Miguel Estéfano, 3687, São Paulo, Brazil, 04301-012,  
e-mail: jprado.01@uol.com.br

REGINA Y. HIRAI

Instituto de Pesquisas Ambientais (IPA), Av. Miguel Estéfano, 3687, São Paulo, Brazil, 04301-012,  
e-mail: regina.hirai@gmail.com

MICHAEL A. SUNDUE

Royal Botanic Garden Edinburgh, 20a Inverleith Row, Edinburgh, EH3 5LR, Scotland, U.K.  
Pringle Herbarium, Department of Plant Biology, 111 Jeffords Hall, 63 Carrigan Dr., University of  
Vermont, Burlington, VT, 05405, USA, Botanical Research Institute of Texas, 1700 University  
Drive, Fort Worth, TX, 76102, USA,  
e-mail: msundue@rbge.org.uk

WESTON L. TESTO

Field Museum of Natural History, 1400 S. DuSable Lake Shore Drive, Chicago, IL, 60605, USA  
Botanical Research Institute of Texas, 1700 University Drive, Fort Worth, TX, 76102, USA,  
e-mail: wtesto@fieldmuseum.org

**ABSTRACT.**—This paper resurrects *Adiantum weatherbyanum*, an overlooked species that occurs in northern Chile, and describes and illustrates a new species, *A. rodriguezii*, from central Chile. Both taxa belong to the *Adiantum poiretii* group and were overlooked by the previous authors who worked on the Flora of Chile. *Adiantum weatherbyanum* is easily recognized by the combination of having of simple and branched, whitish, eglandular hairs on the laminar tissue and veins of the pinnules abaxially, and short ciliate rhizome scales. *Adiantum rodriguezii* is distinct by its pubescent pinnules on both surfaces; the hairs are simple, articulate, 0.5–1.2 mm long, light brown, with eglandular apices, and restricted to the pinnule veins. Relevant taxa are provided with descriptions, comments, and illustrations of the diagnostic characters.

**KEY WORDS.**—Adiantoids, *Adiantum poiretii* group, endemic species, taxonomy

Chile has long been recognized for its highly endemic flora due to geographic isolation (Scherson *et al.*, 2017). This is true of its fern flora as well (Suissa, Sundue, and Testo, 2021). Among ferns, *Adiantum* is particularly rich in endemic species (Rodríguez, 1995), and most Chilean endemics sampled to date form a monophyletic clade (Hirai *et al.*, 2016), providing evidence for local radiation. However, the number of taxa recognized, and their taxonomic rank has varied between treatments, and the reported geographic distribution reported for these taxa has been varied as well. When Rodríguez published the Flora of Chile in 1995, he treated seven species and two varieties of *Adiantum*, six of these species belong to the *Adiantum poiretii* group in the sense of Hirai

---

\* Author for correspondence

*et al.* (2016) or the *formosum* clade in the sense of Huiet *et al.* (2018). One species (*A. capillus-veneris* L.) belongs to the *capillus-veneris* clade, sensu Huiet *et al.* (2018). Four species were considered endemic to Chile: *A. excisum* Kunze, *A. gertrudis* Espinosa, *A. pearcei* Phil., and *A. scabrum* Kaulf (Flora del Conosur; Zuloaga, Morrone, and Belgrano, 2008). The latter also occurs in Argentina, and it was cited in the country as *A. chilense* var. *scabrum* (Kaulf.) Hicken by Giudice (2016). The other two taxa, *A. chilense* Kaulf. var. *chilense* and *A. sulphureum* Kaulf. also occur in Chile and Argentina. *Adiantum chilense* var. *chilense* can be also found in the Falkland Islands (Rodríguez, 1995).

Rodríguez (2015) and Rodríguez *et al.* (2018) updated their Catalog of the Vascular Plants of Chile treating many species of *Adiantum* at the varietal level. In 2018, they recognized six species (*A. capillus-veneris*, *A. chilense*, *A. excisum*, *A. gertrudis*, *A. pearcei*, and *A. sulphureum*), and five varieties (*A. chilense* var. *hirsutum* Hook & Grev., *A. chilense* var. *scabrum*, *A. sulphureum* var. *majus* Hook., *A. sulphureum* var. *sulphureum*). However, Sundue, Prado, and Smith (2010) had treated *A. chilense* var. *hirsutum* as a synonym of *A. glanduliferum* Link.

As these treatments indicate, the Flora of Chile is well known, yet this high-level of local diversity along with the confusion created by differences in taxonomic rank have led to some taxa being overlooked.

The latest novelty in *Adiantum* for Chile was described by Cádiz-Véliz *et al.* (2023). They presented a new endemic species, *A. viscosum* A. Cádiz-Véliz & A. E. Villarroel, that grows in the sclerophyllous forests of Central Chile (Valparaíso Region).

Our studies in the last decade on *Adiantum* have led us to recognize one more overlooked species and discover one altogether new one. The undescribed species was discussed in Sundue, Prado, and Smith (2010) but at that time, we had not observed sufficient material to circumscribe the taxon. Both taxa belong to the *Adiantum poiretii* group which is distinguished by the combination of 1–4-pinnate fronds, non-articulated segments, the color of the petiole extending to the laminar tissue of the pinnules, veins ending in sinuses on the margin of the segments, and oblong to lunate indusia. In this paper, we present both the new species and the previously overlooked one to advance our understanding of diversity in *Adiantum* and the flora of Chile.

#### MATERIALS & METHODS

The present work was based on material deposited in the following herbaria: B, CONC, E, F, GH, HAL, LP, NY, SGO, SI, SP, VT, and US (herbarium acronyms according to Thiers [2022], continuously updated). Morphological terms follow Lellinger (2002), and the line drawings were prepared by Klei Sousa (Fig. 1A–K). For all types, barcode numbers were cited when this information was available.

The distribution map was generated in QGIS (v. 3.10.10) using coordinates obtained from specimen label data. For some records, coordinates were estimated from locality data; estimated coordinates appear between brackets.

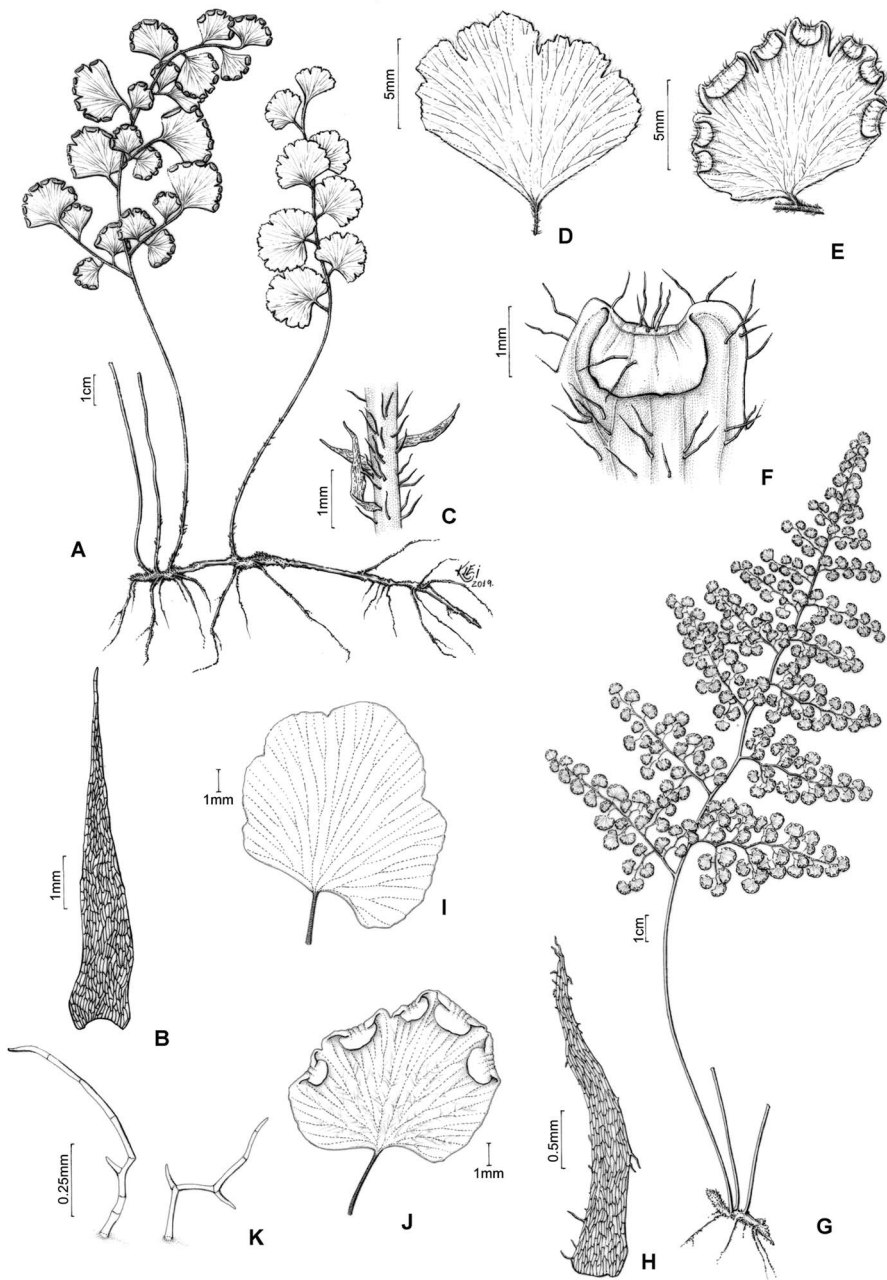


FIG. 1. A–F. *Adiantum rodriguezii*. A. Habit. B. Rhizome scale. C. Detail of scales and hairs on the stipe. D. Sterile pinnule. E. Fertile pinnule, abaxial view with indusia. F. Detail of indusium and hairs (from Parra 11487, LP). G–K. *Adiantum weatherbyanum*. G. Habit. H. Rhizome scale. I. Sterile pinnule. J. Fertile pinnule with indusia. K. Detail of hairs (from Marticonera et al. 806, CONC).

## RESULTS AND DISCUSSION

**Overlooked taxon:**

*Adiantum weatherbyanum* Espinosa, Bol. Mus. Nac. Hist. Nat., Santiago de Chile 15: 93. 1936. Holotype.—CHILE. Prov. Antofagasta: Dept. Taltal, Vicinity of Aguada de Miguel Diaz, ca. 24°35'S, [70°20'W], 1–4 Dec 1925, *I.M. Johnston 5307* (SGO barcode SGO000000498 [image!]; isotypes: GH barcode GH00020387!; US barcode US00142206 [image!]). Figs. 1G–K, 2.

**Plants** terrestrial. **Rhizomes** 3–4 mm diam., slender, short-creeping, compact, brown, scaly, the scales 2.0–3.0 × 0.5–0.7 mm, lanceolate, brown, concolorous, shiny, basifixed, margins short ciliate, apex filiform. **Fronde**s closely spaced (1–3 mm apart), erect; **stipes** 5.0–12.0 cm × 1.0 mm, ca. 1/2 the frond length, sulcate adaxially, dark brown, slightly lustrous, mostly glabrous; **rachis** slightly flexuous, dark brown, slightly pubescent, the hairs 0.5–1.0(–1.5) mm long, simple and branched, slightly catenate, brown, eglandular; **laminae** herbaceous, 15.0–18.0 × 5.0–12.0 cm, deltate, 3-pinnate proximally, 1- or 2-pinnate distally; **pinnae** 10–12 pairs, stalked, the stalk of the proximal pinna pair 5.0–10.0 mm long, apex gradually reduced, alternate; **proximal acroscopic pinnule** of each pinna not overlapping the main rachis; **ultimate segments** 0.5–0.7 × 0.7–1.0 cm, stalked, the stalk 2.0–5.0 mm long, non-articulate, with dark color passing into the pinnule base, flabellate, truncate to cordate at base, margins entire, apex round, sterile margins entire to slightly denticulate, abaxially densely pubescent, the hairs on the veins and on the laminar tissue, the hairs 0.5–1.0(–1.5) mm long, simple and branched, hyaline to pale brown, eglandular, adaxially glabrous; **veins** free, forking, ending in the sinuses between marginal teeth; **sori** 3–9 per pinnule, on the margins of the segments, except at base; **indusia** 0.8–1.0 mm wide, glabrous, oblong, yellow-farinoe.

DISTRIBUTION AND ECOLOGY.—Northern Chile (endemic). This species grows in moist soils under rocks along the hills, in the warm desert, and in semi-desert scrub and grassland (Luebert and Pliscoff, 2022); 150–550 m.

SPECIMENS EXAMINED.—CHILE. **Región II (Antofagasta)**: Prov. Antofagasta, quebrada La Oveja, 350 m, 25°7'S, 70°26'W, 12 Oct 2005, *A. Marticorena et al. 806* (CONC). Aguada Cardon, ca. lat. 24°45'S, [70°20'W], 30 Nov 1925, *I.M. Johnston 5296* (GH); Prov. Antofagasta, Quebrada Rinconada, ca. 5 km N of Caleta Paposo, upper reaches of narrow quebrada, 240–550 m, 22°56'S [ca. 24° 50'S], 70°30'W, 4 Nov 1988, *M. Dillon & D. Dillon 5861* (F); idem, Vicinity of Aguada Miguel Díaz, quebrada south of Punta dos Reyes, arid hillsides with scattered vegetation, 250–450 m, 24°36'S, 70°33'W, 14 Nov 1988, *M. Dillon & D. Dillon 5913* (F); idem, Quebrada Rinconada, ca. 5 km N of Caleta Paposo, ca. 550 m alt., 24°56'S, 70°30'W, growing in protected rocky crevices, 19 Nov 1988, *M.O. Dillon et al. 5976* (F); idem, Quebrada Mantacilla, lower slopes, 150–500 m, 25°06'S, 70°27'W, Coastal lomas formations,

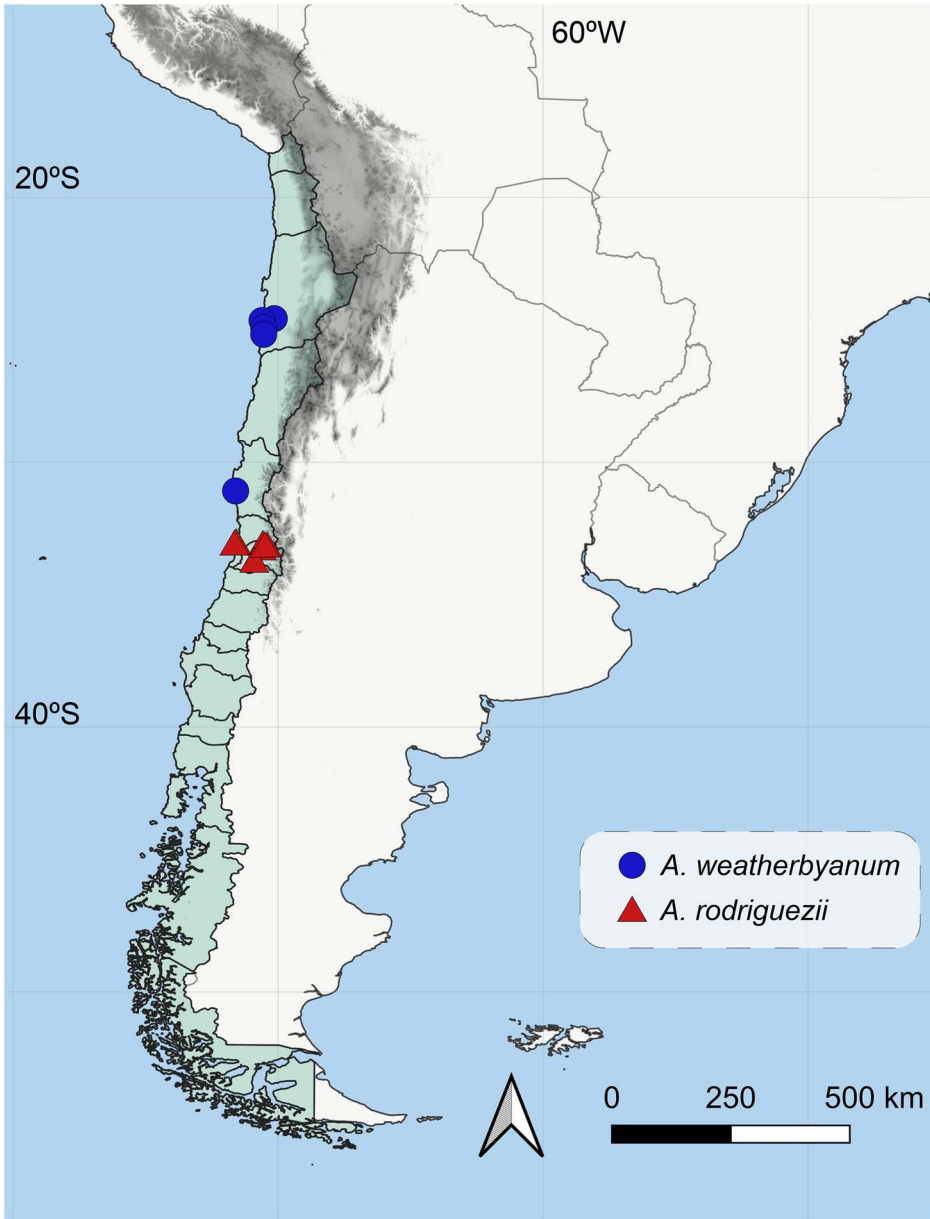


FIG. 2. Distribution map of *Adiantum rodriguezii* (triangle) and *A. weatherbyanum* (circle) in Chile.

perennial from rock crevices, 27 Nov 1997, *M.O. Dillon & M. Villaruel* 8121 (F). **Región IV (Coquimbo)**: Prov. Elqui, Coquimbo, Corral de Julio, 340 m, exclusión Aguas Malas, [ca. 31°10'S, 71°37'W], 6 Nov 1976, *M. Muñoz S.* 847 (F).

This species can be recognized by the ciliate rhizome scales, slightly flexuous rachises, and densely pubescent pinnules abaxially; the hairs are whitish, simple, or branched, and eglandular, and occur on the veins and laminar tissue. Additionally, the ultimate segments adaxially are glabrous (Fig. 1G–K).

*Adiantum weatherbyanum* is distinguished from other Chilean species by having rhizome scales with ciliate margins. The most similar Chilean species are *A. glanduliferum* and *A. rodriguezii*, but they differ in having rhizome scales with entire margins.

Espinosa (1936) commented that *Adiantum weatherbyanum* is clearly distinguished by the presence of glands between the sporangia, pinnules abaxially with hairs, and fimbriate rhizome scales. However, in our experience, while the pubescence is distinctive, the glands are not easily observed. Johnston (1929) treated the collection Johnston 5307 as *Adiantum chilense* var. *hirsutum*.

### New species:

*Adiantum rodriguezii* J. Prado, R.Y. Hirai & Sundue, **sp. nov.** Holotype.—Chile, Valparaíso, El Salto, Camino El Olivar, 100 m, [ca. 33°02'S, 71°30'W], 3 Oct 1982, B. Parra L. 11487 (LP barcode LP009721). Figs. 1A–F, 2.

**Plants** terrestrial. **Rhizomes** 1–2 mm diam., slender, short to long-creeping, compact or spaced, brown, scaly, the scales 1.5–3.0 × 0.3–0.5 mm, lanceolate, dark brown, concolorous, shiny, basifixed, margins entire, apex filiform. **Fronds** closely spaced (1–3 mm apart) to moderately spaced (0.5–0.8 cm apart), erect; **stipes** 1.5–13.0 cm × 0.5–1.0 mm, 1/3–1/2 the frond length, sulcate adaxially, castaneous to dark brown, lustrous, pubescent, with scales and hairs patent, the scales 1.5–3.0 × 0.1–0.5 mm, lanceolate to filiform, light brown to yellowish, concolorous, shiny, basifixed, margins entire, apex filiform, the hairs articulate, 0.5–1.2 mm long, light brown, apex eglandular; **rachis** straight, castaneous to dark brown, pubescent, the indument similar to that of the stipes; **laminae** herbaceous, 5.5–16.0 × 2.0–5.5 cm, oblong-lanceolate, 2- or 3-pinnate proximally, 1- or 2-pinnate distally; **pinnae** 5–8 pairs, stalked, the stalk of the proximal pinna pair 3.0–7.0 mm long, apex gradually reduced, alternate; **proximal acroscopic pinnule** of each pinna not overlapping the main rachis; **ultimate segments** 0.5–2.0 × 0.5–2.0 cm, stalked, the stalk 1.0–3.0 mm long, non-articulate, with dark color passing into the pinnule base, suborbicular, flabellate, cuneate to truncate at base, margins ciliate, apex round, lobate to slightly incised, sterile margins denticulate, abaxially and adaxially pubescent, the hairs on the veins and on the laminar tissue, similar to those stipes and rachis; **veins** free, forking, ending in the sinuses between marginal teeth; **sori** 5–15 per pinnule, on the margins of the segments, except at base; **indusia** 0.7–1.0 mm wide, glabrous or with few hairs, oblong to lunate, non-farinose.

**DISTRIBUTION AND ECOLOGY.**—Central Chile (endemic). This species occurs on the hills in the Mediterranean forest and woodland (Chilean Mediterranean sclerophyllous forest; Luebert and Pliscoff, 2022); 100–1200 m.

SPECIMENS EXAMINED.—CHILE. **Región V (Valparaíso)**: Near Valparaíso, [ca. 33° 03'S, 71°36'W], 16 Sep 1914, *J.N. Rose & J.S. Rose 19125* (NY, US). **Región RM (Santiago)**: Comuna de La Reina, Quebrada de Ramón, 1200 m, 33°26'S, 70° 30'W, 24 Sep 2000, *A. Tomé R. 12* (CONC); Prov. Chacabuco, Colina, Baños de Colina, 945 m, 33°11'S, 70°36'W, *C. Aedo 6743* (CONC); Prov. Maipo, Cerro Cantillana, empezando a subir el cerro, 585 m, 33°50'S, 70°56'W, 15 Sep 2003, *A. Marticorena 555* (CONC); Santiago, Cerro San Cristóbal, [ca. 33°25'S, 70° 37'W], 10 Nov 1923, *G. Looser s.n.* (SI); Santiago de Chile, Agua del León, Chonchalé, 1100 m, [ca. 33°23'S, 70°42'W], 8 July 1927, *G. Looser 329* (GH); idem, id., 1000 m, 19 Aug 1928, *G. Looser 722* (GH); cerca de Santiago, 1100 m, 6 Sep 1928, *G. Looser 733* (GH). Prov. unknown, anonymous fragment given to G. E. Davenport from Hooker, Oct 14/78, "Chile" (GH).

ETYMOLOGY.—The epithet honors Prof. Dr. Roberto Rodríguez, who has dedicated his scientific career to studying the ferns and lycophytes of Chile.

*Adiantum rodriguezii* can be recognized by the pubescent fronds. The indument is formed by scales and hairs, the scales lanceolate to filiform, light brown to yellowish, margins entire, apex filiform, the hairs articulate, 0.5–1.2 mm long, light brown, apex eglandular (Fig. 1A–F).

*Adiantum glanduliferum* is similar to *A. rodriguezii*, but differs in having laminar pubescence restricted to the abaxial veins (vs. present on both surfaces in *A. rodriguezii*). Sundue, Prado, and Smith (2010) observed these differences and suggested that they should be investigated further. Only now have we been able to confirm that this is a new species.

Another similar species is *Adiantum gertrudis* Espinosa. It differs from *A. rodriguezii* by having deeply incised and rhombic pinnules (vs. lobate or slightly incised and suborbicular to flabellate pinnules in *A. rodriguezii*), a deltate lamina (vs. oblong-lanceolate in *A. rodriguezii*) and indument of capitate and acicular hairs on the stipe and fronds, observed in *Teillier & Márquez 4916* (CONC) and *Fernández s.n.* (CONC165412) (vs. acicular hairs only). Additionally, the indusia in *A. gertrudis* are very small and inconspicuous (0.3–0.5 mm wide) whereas in *A. rodriguezii* they are conspicuous (0.7–1 mm wide). Cádiz-Véliz *et al.* (2023) reported only simple hairs in *A. gertrudis* and not capitate hairs. This may be due to their imperfect preservation in old specimens, or simply a matter of terminology. These differences should be investigated further.

#### ACKNOWLEDGMENTS

We thank The New York Botanical Garden and Dr. Robbin Moran for providing all facilities during the visit of the first author to NY, the curators of the herbaria cited here for providing loans, and Klei Sousa for drawing the plate. This study was supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, Proc. n. 303875/2016-0).

#### LITERATURE CITED

- CÁDIZ-VÉLIZ, A., B. PALMA-VILLALOBOS, A. E. VILLARROEL, and M. MUÑOZ-SCHICK. 2023. *Adiantum viscosum* (Pteridaceae), a new species endemic to sclerophyllous forest of Central Chile. *Phytotaxa* 599:183–192.



- ESPINOSA, B. M. E. 1936. Apuntes botánicos sobre helechos chilenos. *Boletín del Museo Nacional* 15:89–106.
- GIUDICE, G. E. 2016. *Adiantum* L. Pp: 330–340. In: *Flora vascular de la República Argentina, vol. 2, Licofitas. Helechos. Gymnospermae*, M. M. Ponce, M. D. Arana (orgs.); F. O. Zuloaga and M. J. Belgrano (eds.). 1<sup>a</sup> ed. Instituto de Botánica Darwinion, San Isidro.
- HIRAI, R. Y., E. SCHUETTEL, L. HUIET, K. M. PRYER, A. R. SMITH, and J. PRADO. 2016. Phylogeny and relationships of the neotropical *Adiantum raddianum* group (Pteridaceae). *Taxon* 65:1225–1235.
- HUIET, L., F.-W. LI, T.-T. KAO, J. PRADO, A. R. SMITH, E. SCHUETTEL, and K. M. PRYER. 2018. A worldwide phylogeny of *Adiantum* (Pteridaceae) reveals remarkable convergent evolution in leaf blade architecture. *Taxon* 67:488–502.
- JOHNSTON, I. M. 1929. Papers on the flora of Northern Chile. Contributions from the Gray Herbarium of Harvard University 85:1–172.
- LELLINGER, D. B. 2002. A modern multilingual glossary for taxonomic pteridology. The American Fern Society, USA.
- LUEBERT, F., and P. PLISCOFF. 2022. The vegetation of Chile and the EcoVeg approach in the context of the International Vegetation Classification project. *Vegetation Classification and Survey* 3: 15–28.
- RODRÍGUEZ, R. R. 1995. Pteridophyta. In: C. MARTICORENA, and R. R. RODRÍGUEZ, (eds.). *Flora de Chile. Vol. 1. Pteridophyta–Gymnospermae*. Universidad de Concepción, Concepción.
- RODRÍGUEZ, R. R. 2015. Notas taxonómicas sobre Pteridófitos chilenos. *Gayana Botanica* 72:94–100.
- RODRÍGUEZ, R. R., C. MARTICORENA, D. ALARCÓN, C. BAEZA, L. CAVIERES, V. L. FINOT, N. FUENTES, A. KIESSLING, M. MIHOC, A. PAUCHARD, E. RUIZ, P. SANCHEZ, and A. MARTICORENA. 2018. Catálogo de las plantas vasculares de Chile. *Gayana Botanica* 75:1–430.
- SCHERSON, R. A., A. H. THORNHILL, R. ÚRBINA-CASANOVA, W. A. FREYMAN, P. A. PLISCOFF, and B. D. MISHLER. 2017. Spatial phylogenetics of the vascular flora of Chile. *Molecular Phylogenetics and Evolution* 112:88–95.
- SUISSA, J. S., M. A. SUNDUE, and W. L. TESTO. 2021. Mountains, climate and niche heterogeneity explain global patterns of fern diversity. *Journal of Biogeography* 48:1296–1308.
- SUNDUE, M., J. PRADO, and A. R. SMITH. 2010. *Adiantum camptorachis* (Pteridaceae), a new species from South America with notes on the taxonomy of related species from the Southern Cone and Bolivia. *American Fern Journal* 100:195–206.
- THIERS, B. 2022. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at: <http://sweetgum.nybg.org/ih/>. Accessed on 2 April 2022.
- ZULOAGA, F. O., O. MORRONE, and M. BELGRANO. 2008. Catálogo de las plantas vasculares del cono sur (Argentina, sur de Brasil, Chile, Paraguay y Uruguay). Vol. 1. Pteridophyta, gymnospermae y monocotyledoneae. Missouri Botanical Garden Press, Saint Louis.