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Ferns and Lycophytes as new challenges

An overlooked or elusive species? *Adiantum raddianum* (Pteridaceae), a new record for Honduran Flora

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Abstract

Adiantum raddianum is reported as a new record for the Honduran Flora. This new occurrence of *A. raddianum* closes a gap of distribution between Guatemala and Nicaragua. We consider this species vegetably similar to these species of *Adiantum* in Honduras: *A. raddianum*, *A. amplum*, *A. andicola*, *A. capillus-veneris*, *A. concinnum*, *A. tenerum,* and *A. thalictroides.* A key to related species is provided.

Key words: distribution, ferns, Mesoamerica, taxonomy.

Resumen

Adiantum raddianum es reportado como un nuevo registro para la Flora hondureña. Esta nueva ocurrencia de *A. raddianum* cierra una brecha de distribución entre Guatemala y Nicaragua. Consideramos a estas especies de *Adiantum* en Honduras vegetativamente similares: *A. raddianum*, *A. amplum*, *A. andicola*, *A. capillus-veneris*, *A. concinnum*, *A. tenerum*, and *A. thalictroides*. Se provee una clave para las especies mencionadas.

Palabras clave: distribución, helechos, Mesoamérica, taxonomía.

Adiantum is a genus of fern from the family Pteridaceae, subfamily Vittarioideae (PPG I 2016). It is distributed in tropical and subtropical regions of the world, and inhabits both primary and secondary forests, from sea level to 5,000 m above in the Andes (Prado & Hirai 2020). All species are characterized by the presence of sporangia, born directly on the reflexed leaf margin (false indusium) (Huiet *et al.* 2018).

The genus comprises ca. 225 species (Hirai & Prado 2019). Several authors have recorded different numbers of species in Honduras, from 15 (Molina 1975) to 23 (Nelson *et al.* 1996; Reyes-Cháves *et al.* 2021). In Tryon & Tryon (1982), *Adiantum raddianum* C. Presl was placed in the subclade of *capillus-veneris*. Phylogenetic studies have revealed that *A. raddianum* was retrieved in the clade *formosum* and defining the subclade of *Adiantum raddianum* (Hirai *et al.* 2016; Huiet *et al.* 2018; Hirai & Prado 2019),

This work aims to present a new record of *A. raddianum* from Honduras. Also, comment on the reason for the few collections of the species in the country. In addition, a key based on morphological characters is presented for vegetatively similar species to *A. raddianum*. This work contributes to studies of the taxonomic treatment of *Adiantum* in Honduras.

Adiantum raddianum was collected in a limestone wall in the northern region of Tegucigalpa. We reviewed physically the collections deposited in EAP, TEFH. We virtually consulted to CURLA, HJBL, and USF collections. Data from GBIF were also reviewed to confirm specimens determined

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as *A. raddianum*. The determination was made using the Mesoamerican Flora taxonomic keys (Moran *et al.* 1995). Type herbarium specimens were studied through digital images (JSTOR, <https://plants.jstor.org/>) and the protologue was consulted online for the correct name use (<https://www.biodiversitylibrary.org/>). Acronyms for Herbaria are used according to Thiers (continuously updated). The map was generated using QGIS version Firenze 3.28 (QGIS Development Team 2023). The key was made by consulting the works of *Adiantum* by Scamman (1960), Palacios-Rios & Riba (1983), Moran *et al.* (1995), and Hirai & Prado (2019).

Taxonomy

Adiantum raddianum C. Presl, Tent. Pterid. 158. 1836. Holotype: Raddi, Pl. Bras. Nov. Gen., t. 78, f. 2 .1825. Figs. 1a-g; 2

Rhizome thin, short creeping; scales 1–3 × 0.5–0.7 mm, linear-lanceolate to subulate, entire, concolorous, brown, shiny; petiole glabrous blackish to dark brownish, shiny; lamina 10–25 × 8–15 cm, ovate to lanceolate, 2–4-pinnate, glabrous on both surfaces, green; pinnae 6–10 pairs, the largest 8 × 5–15 cm, stalked, the basal pinnate acroscopic pinnate and without overlapping to the rachis; rachis and coast glabrous; last segments 1–1.5 × 0.8–1 cm, obovate, stalked, the stalk 3–5 mm, not dilated, the dark color passing to the segment base; veins of sterile segments ending in sinuses; sori 2–8 per segment, 0.8–1.2 mm, round, without yellow farina between sporangia.

Studied Material: DISTRITO CENTRAL: Tegucigalpa, 5.IV.2023, *A. Rubio 333* (TEFH). OCOTEPEQUE: Belén Gualcho village and surroundings, 40 km. al E. de Nueva Ocotepeque, 29.VI.1976, *C. Nelson 3644* (EAP, TEFH).

Adiantum raddianum is a common species in the Neotropics, its distribution extends from Central Mexico south to Venezuela, Brazil, Argentina, and Uruguay, as well as the Greater and Lesser Antilles. Its ornamental use is currently understood as naturalized in the Old World (Hirai *et al.* 2014; Hirai & Prado 2019). *Adiantum raddianum* was expected in Honduras since there are records in neighboring countries. This occurrence of *A. raddianum* closes a distribution gap between Guatemala and Nicaragua.

Adiantum raddianum has an altitudinal distribution in the Neotropics ranging from approximately 0–2,200 m (Hirai & Prado 2019). In Honduras, *A. raddianum* is equally expected in that altitudinal range, however, it is not collected frequently, and in Honduras, it is known from only two records.

The species of *Adiantum* in Honduras that we consider vegetatively most similar to *A. raddianum* are *A. amplum* C. Presl, *A. andicola* Liebm., *A. capillus-veneris* L., *A. concinnum* Humb. & Bonpl. *ex* Willd., *A. tenerum*

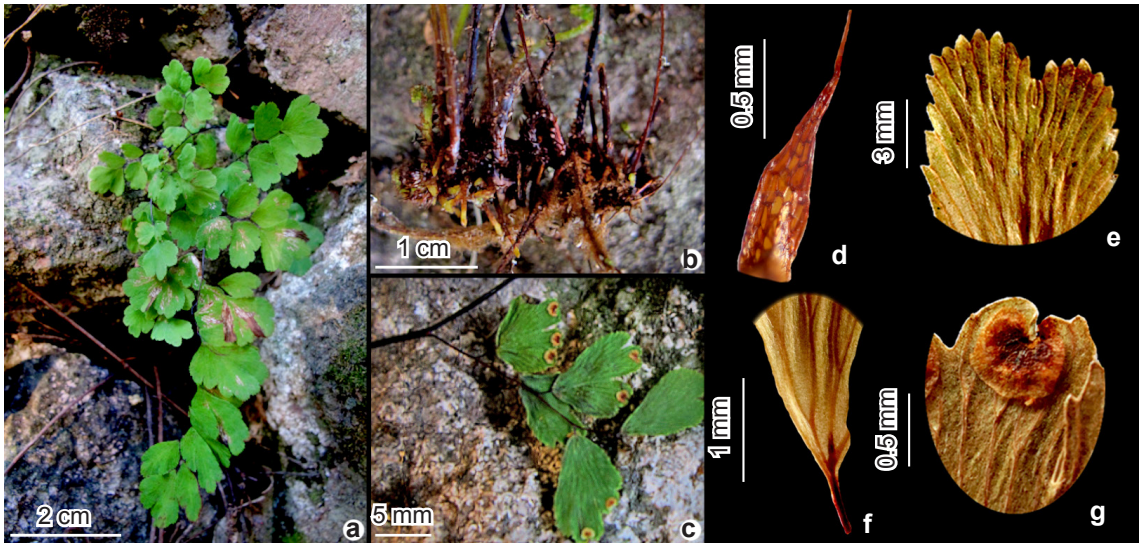

Figure 1 – a-g. *Adiantum raddianum* – a. habit; b. rhizome short creeping; c. pinnae; d. scale; e. veins of sterile segments ending in sinuses; f. color of the stalk passing to the segment base; g. round sorus.

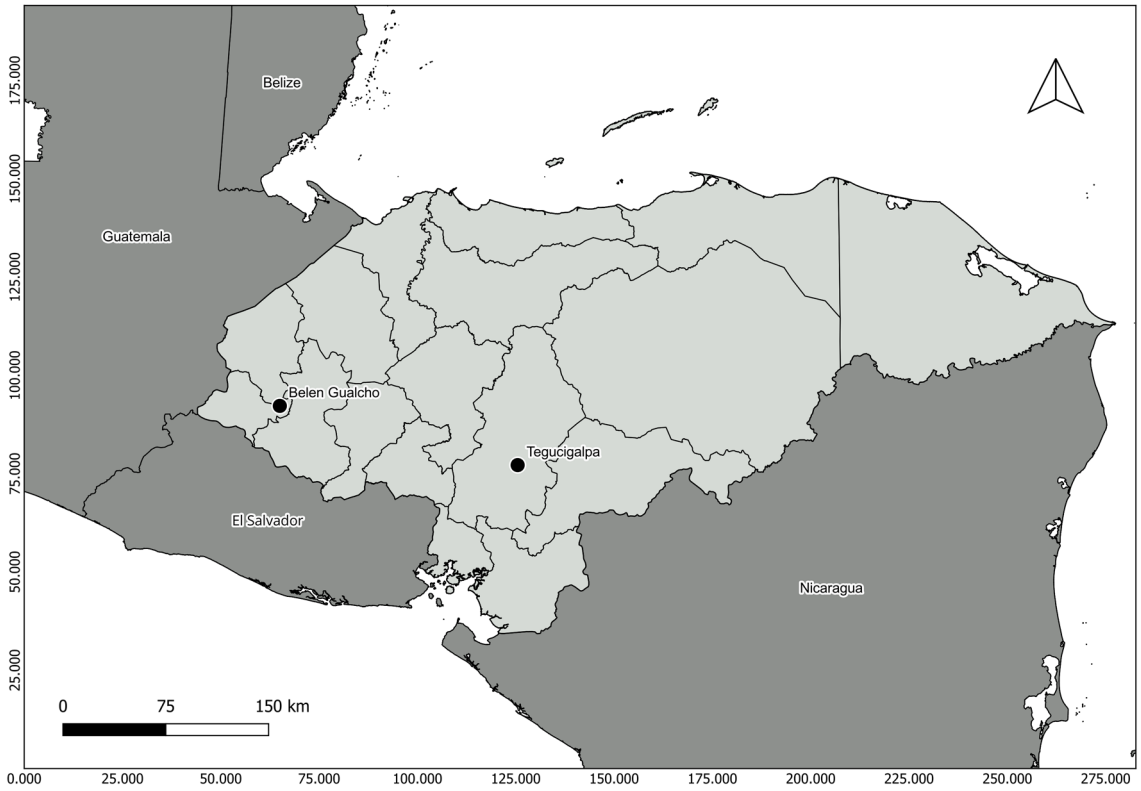

Figure 2 – Map showing the known geographic distribution of Adiantum raddianum in Honduras (black dots).

Sw., and *A. thalictroides* Willd. *ex* Schltdl. We provide the morphological characters that distinguish these species in Table S1 (available on supplementary material <https://doi.org/10.6084/m9.figshare.24424861.v1>).

These similar species are those with 2–5 pinnate lamina, blade with a gradually attenuated apex, differently from the lateral pinnae, with the last segments being stalked or sessile and can be ovate, obovate circular, semicircular, flabellate, or rhombic, with a size range between 8 mm to 25 mm, based on Moran *et al.* (1995). Scamman (1960) comments that the variability of the segments in *A. raddianum* makes it a complex species. Hirai & Prado (2019) discussed that *A. raddianum* is extremely variable in its form. This creates an overlap in morphological characteristics between similar species, so we consider this aspect the reason for the low documentation of this species in Honduras and why the wrong determinations have been made. This is evident in the specimen *C. Nelson 3644* (EAP, TEFH) which was first determined as *A. tenerum*, and then as *A. capillus-veneris*. Also, the specimen *N. Cristoff 127* (USF) which has as first determination *A. poiretti* Wikstr. (*A. thalictroides*) and then as *A. raddianum,* however, we were able to corroborate that it is a specimen of *A. tenerum.*

Adiantum feei T. Moore *ex* Fée and *A. tricholepis* Fée are not considered in this work. Since *A. feei* densely pubescent rachis, coasts, and stalks make it easily differentiated, likewise *A. tricholepis* Fée by the erect trichomes on both surfaces of the segments.

Key for *Adiantum* species vegetatively similar to *A. raddianum* in Honduras

1. Pinnae 10–25 pairs; basal acroscopic pinnule overlapping the rachis ..... *Adiantum concinnum*
1'. Pinnae 4–12 pairs; basal acroscopic pinnule not overlapping to the rachis 2
2. Color of the stalk not passing to the segment base 3

3. Ultimate segments glaucous beneath; stalk of the last segments not dilated at the apex or faintly dilated; scales usually black and entire ..... *Adiantum andicola*

3'. Ultimate segments green beneath; stalk of the last segments conspicuously dilated at the apex; scales brown to light brown, ciliated or sparsely denticulate 4

4. Veins of the sterile segments ending in entire margins; scales faintly denticulate and concolorous ..... *Adiantum amplum*

4'. Veins of sterile segments ending in teeth; scales long ciliated, bicolored or occasionally concolorous ..... *Adiantum tenerum*

2'. Color of the stalk passing to the segment base 5

5. Sterile margins of segments sharply serrate; veins of sterile segments ending in teeth .... *Adiantum capillus-veneris*

5'. Sterile margins of segments not sharply serrate; veins of the sterile segments ending in sinuses or entire margins 6

6. Sori oblong, frequently with yellow farina between sporangia; scales lanceolate to linear-lanceolate, entire, or minute and sparsely denticulate, concolorous, orange to dark brown... ..... *Adiantum thalictroides*

6'. Sori circular, without yellow farina between the sporangia; scales linear-lanceolate to subulate, entire, concolorous, dark brown, concolorous, and shiny ..... *Adiantum raddianum*

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Data availability statement

In accordance with Open Science communication practices, the authors inform that all data are available within the manuscript.

References

Hirai RY & Prado J (2019) Neotropical species of the *Adiantum raddianum* group (Pteridaceae). Willdenowia 49: 295-317. DOI: https://doi.org/10.3372/wi.49.49302

Hirai RY, Sundue MA & Prado J (2014) *Adiantum alan-smithii* (Pteridaceae), a new maidenhair fern from Chiapas, Mexico. Systematic Botany 39: 380-383. DOI: https://doi.org/10.1600/036364414X680942

Hirai RY, Schuettpelz E, Huiet L, Pryer KM, Smith AR & Prado J (2016) Phylogeny and relationships of the neotropical *Adiantum raddianum* group (Pteridaceae). Taxon 65: 1225-1235. DOI: https://doi.org/10.12705/656.1

Huiet L, Li FW, Kao TT, Prado J, Smith AR, Schuettpelz E & Pryer KM (2018) A worldwide phylogeny of *Adiantum* (Pteridaceae) reveals remarkable convergent evolution in leaf blade architecture. Taxon 67: 488-502. DOI: https://doi.org/10.12705/673.3

Molina A (1975) Enumeración de las plantas de Honduras. Ceiba 19: 1-118.

Moran RC, Zimmer B & Jermy AC (1995) 3. *Adiantum* L. *In*: Moran RC & Riba R (eds.) Flora Mesoamericana 1. Psilotaceae a Salviniaceae. *In*: Davidse GM, Sousa Sánchez M & Knapp S (eds.) Flora Mesoamericana. Vol. 1. Universidad Nacional Autónoma de México, México D.F. Pp. 106-117.

Nelson C, Gamarra R & Fernández J (1996) Hondurensis plantarum vascularium catalagus Pteridophyta. Fontqueria 43: 1-223.

Palacios-Rios M & Riba R (1983) Helechos de Veracruz: *Adiantum* (Pteridaceae). Botanical Sciences 44: 43-62.

PPG I (2016) A community-derived classification for extant lycophytes and ferns. Journal of Systematics and Evolution 54: 563-603. DOI: https://doi.org/10.1111/jse.12229

Presl CB (1836) Tentamen Pteridographiae, seu genera filicacearum praesertim juxta venarum decursum et distributionem exposita. Typis Filiorum Theophili Haase, Pragae. 158p. DOI: https://doi.org/10.5962/bhl.title.630

Prado J & Hirai RY (2020) *Adiantum* (Pteridaceae) in Brazil: key to the species and illustrations. Biota Neotropica 20: e20201119. DOI: https://doi.org/10.1590/1676-0611-BN-2020-1119

QGIS Development Team (2023) QGIS Geographic Information System. QGIS Association. Version Firenze 3.28. Available at <https://qgis.org/>. Access on 2023.

Reyes-Chávez J, Tarvin S & Batke S P (2021) Ferns

and Lycophytes of Honduras: a new annotated checklist. Phytotaxa 506: 1-113. DOI: https://doi.org/10.11646/phytotaxa.506.1.1

Scamman E (1960) The maidenhair ferns (*Adiantum*) of Costa Rica. Contributions from the Gray Herbarium of Harvard University 187: 3-22.

Thiers B (continuously updated) Index Herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at <http://sweetgum.nybg.org/science/ih/>. Access on 6 April 2023.

Tryon RM & Tryon AF (1982) Ferns and allied plants. With special reference to Tropical America. Springer-Verlag, New York. Pp. 319-332.

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