Novelties in Adiantum (Pteridaceae) from South America

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Source: Willdenowia, 47(3) : 237-242
Published By: Botanic Garden and Botanical Museum Berlin (BGBM)
URL: https://doi.org/10.3372/wi.47.47307
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Novelties in Adiantum (Pteridaceae) from South America

Introduction

Adiantum L. is a large genus described by Linnaeus (1753) with a worldwide distribution (Mickel & Smith 2004). The genus is monophyletic (Rothfels & Schuettpelz 2014; Fryer & al. 2016; PP 2016) and has about 225 species. It is characterized by terete, blackish to castaneous petioles, rachises and costae, and sporangia borne on the false indusium (i.e. not on the abaxial laminar surface below it). The rhizomes are short- to long-creeping, usually horizontal, but sometimes compact and suberect, with scales. Laminae are monomorphic or nearly so, pinnate (rarely undivided) to 5-pinnate, sometimes pedate with free or rarely anastomosing veins without included free veinlets and with or without linear epidermal idioblasts (false veins) between the true veins. Sori are formed on the veins of the recurved laminar margins (false indusia), and paraphyses are absent.

Our recent studies and those of others have revealed several new Adiantum species for South America in the last 11 years, e.g.: Peru, one species (Prado 2006); Bolivia, one species (Prado 2006); Argentina, one species (Sundue & al. 2010); Ecuador, one species (McCarthy & Hickey 2011); Brazil, one species (Prado & Hirai 2013); French Guiana, one species (Zimmer 2007); Guyana, one species; and French Guiana, three species (Boudrie & al. 2017).

The two new species described here represent one more step in the process to understand the diversity of Adiantum in the Amazon region.

Material and methods

This study is based on specimens from the following herbaria: AMAZ, COAH, CUZ, INPA, NY, QCA, QCNE, SP, TUR, UC, US and USM. Species recognition was...
based on morphological characters such as rhizomes, scales, laminar dissection, indumentum and pseudoindusia. We have illustrated the most distinctive characters for each species.

Bracketed geographic coordinates were estimated based on the closest localities, when that information was not given on the specimen label.

The dot-distribution maps are based on all specimens studied for a given species.

Results and Discussion

_Adiantum nodosum_ J. Prado, R. Y. Hirai & A. R. Sm., sp. nov. – Fig. 2.
Holotype: Peru, Loreto, Mariscal Ramon Castilla, Río Yaguasucayu, 2–5 km SW from the village of Puerto Iznango, primary upland rain forest on a sandy terrace of Río Amazonas, 03°18’S, 72°01’W, 100–150 m, 23 May 1997, H. Tuomisto, K. Ruokolainen, V. Vargas & J. Vormisto 11250 (UC barcode UC1788281; isotypes: AMAZ, SP, TUR 3 sheets, USM).

Morphological description — Plants terrestrial. Rhizomes short-creeping, (1.5–)3–5 mm in diam., scaly, with stipes (1–)5–10 mm apart, scales light to dark brown, shiny, lanceolate, margin entire to sparingly denticulate. Fronds (25–)60–76 cm long; stipe black, c. 0.6 × as long as frond, adaxially sulcate, sparsely scaly, scales appressed throughout, dark brown, concolorous, linear, (1–)1.5–2 mm long, base with several processes, margin entire, apex filiform; also with some arachnoid scales c. 0.5 mm long; lamina 2-pinnate, not reduced at base, 15–28 cm wide; rachis with indumentum similar to that of stipe; pinnae elliptic, slightly narrowed at base, tapering at apex, (8–)11–20 × 2–4 cm, indumentum of pinna rachis like that of stipe and main rachis; lateral pinnae in (1 or) 2–4(–6) pairs (3–6 pairs in fertile fronds, fewer than 4 in sterile fronds), alternate, ascending; terminal pinnae conform, almost as long as or 1–1.2 × as long as subtending pinnae; pinnules in 10–32 pairs, not articulate, conspicuously oblique to pinna rachis, 2–3 × as long as wide, chartaceous, adaxial surface glabrous, abaxial surface sparsely scaly, scales borne on veins, light brown, 0.5–1 mm long, base pectinate, apex filiform and tortuous; pinnules free-veined, without evident midrib, veins slightly prominent, with oblique idioblasts between veins on both surfaces; proximal pairs of pinnules reduced, somewhat rounded to deltate, medial pairs diminish, trapeniform, acroscopic base rectangular, sterile margins irregularly denticulate or serrate, sterile apices obtuse, straight or curved toward pinna apex, fertile apices angular; distal pinnules c. ½ or less length of medial pinnules; terminal pinnule on each pinna broadly rhombic, similar in size or usually longer than distal ones. Sori mostly 5–7( or 8) per pinnule, lunate, oblong: indusia

![Distribution of _Adiantum nodosum_ and _A. pseudocajennense_.](https://bioone.org/journals/Willdenowia)
light brown to dark brown, lunate, glabrous, margin entire; spores light brown, trilete.

**Distribution and ecology** — Amazonian forests in Colombia, Peru and Brazil (Fig. 1). Growing in the floodplains and banks of creeks on waterlogged and often muddy sites, at 100–350 m. Usually terrestrial, but can also grow on the bases of tree trunks.

**Etymology** — The specific epithet is based on the morphology of the rhizome, with approximate stipes, leading to a nodose appearance of the rhizomes. This feature
is more evident on small specimens where the stipes are 1–1.5 mm apart.

Additional specimens examined — BRAZIL: AMAZONAS: Presidente Figueiredo, Distrito de Balbina, margem direita da estrada de acesso à Vila de Balbina, Ramal da Morena, margem do Rio Uatumã, [02°07'06"S, 59°19'07"W], 100 m, 3 Feb 2008, J. Prado & al. 1873 (NY, SP, TUR, US). PARA: Novo Progresso, Fazenda Sr. Sérgio, 15 km Sul do NP pela BR-163, 07.15012°S, 55.41845°W, 8 Dec 2009, F. O. Figueiredo & al. 1372 (INPA). — COLOMBIA: AMAZONAS: Rio Caquetá, 0.5 km E of Estrecho (9 km E of confluence of Rio Metá and Caquetá), 00°57'S, 71°32"W, 150–250 m, 28 Apr 1998, H. Tuomisto & al. 12232 (COAH, TUR 4 sheets); idem, close to mouth of Rio Sábalo but on opposite shore of Caquetá, 01°03'S, 71°34"W, 150–250 m, 22 May 1998, H. Tuomisto & al. 12391 (COAH, TUR 2 sheets). — PERU: LORETO: Ramon Castilla, Rio Yaguasuyacu, 2–5 km SW from village of Puerto Izango, 03°18'S, 72°01'W, 100–150 m, 23 May 1997, H. Tuomisto & al. 11264 (AMAZ, BM, SP, TUR 2 sheets, USM); idem, 03°18'S, 72°01'W, 100–150 m, 23 May 1997, H. Tuomisto & al. 11251 (AMAZ, TUR, USM); idem, 03°18'S, 72°01'W, 100–150 m, 23 May 1997, H. Tuomisto & al. 12624 (TUR 2 sheets); idem, 2 km S from village of Puerto Izango, Rio Yaguasuyacu, 03°18'S, 72°00'W, 100–150 m, 21 Aug 1998, H. Tuomisto & al. 12684 (AMAZ, NY, TUR 2 sheets, UC, US, USM); idem, 1 km NE from village of Nueva Esperanza, 03°20'S, 71°59'W, 100–150 m, 23 Aug 1998, H. Tuomisto & al. 12717 (AMAZ, TUR 2 sheets, USM); idem, Rio Ampiyacu, 3 km SW from village of Nueva Esperanza, 03°21'S, 72°00'W, 100–150 m, 24 Aug 1998, H. Tuomisto & al. 12722 (AMAZ, SP, TUR 2 sheets, USM); idem, Río Yavarí-Mirín, Bosque primario, 04°29'S, 72°20'W, 100–200 m, 13 Apr 2002, G. Cárdenas & K. Salovaara 1374 (AMAZ, TUR); idem, Río Yavarí-Mirín, bosque primario, 04°24'S, 72°15'W, 100–200 m, 21 Mar 2002, G. Cárdenas & K. Salovaara 1280 (AMAZ, TUR 2 sheets, USM); idem, Río Tigre, 2.5 km SW from village 28 de Julio W of river, 03°29'S, 74°49'W, 100–200 m, 5 Feb 2005, H. Tuomisto & al. 14942 (AMAZ, TUR); idem, Tierra firme 1 km E of river, 03°41'S, 74°33'W, 100–200 m, 8 Feb 2005, H. Tuomisto & al. 14966 (AMAZ, TUR 2 sheets, USM). MADRE DE DIOS: Manu, Río Madre de Dios, S of river and 15 km W from mouth of Río Azul, 12°26'S, 70°43'W, 250–350 m, 30 Oct 1998, H. Tuomisto & al. 13558 (CUZ, TUR).

Diagnostic features — Adiantum nodosum is characterized by having rhizomes nodose (i.e. with stipes approxi-
2 or 4(–6) pairs of lateral pinnae (3–6 pairs in fertile
fronds, fewer than 4 in sterile fronds); margin of ster-
elate pinnae irregularly denticulate or serrate; pinnaules
abaxially with sparse scales on veins at base; scales light
brown, 0.5–1 mm long, base pectinate, apex filiform; and
indusia glabrous, margin entire.

Adiantum nodosum resembles Adiantum tetraphyllum,
but the latter differs in having thicker rhizomes (> 5 mm in diam.), sterile pinnaules with acute apices that
are curved toward the pinna apices, and rachises with
filiform scales adaxially and lanceolate scales abaxially.
Additionally, in A. tetraphyllum the terminal pinnale of
each pinna is long-linear (vs. broadly rhombic), and the
indusia are shortly oblong and pubescent (vs. lunate and
glabrous).

Adiantum nodosum grows in similar swampy sites as
A. pseudocajennense. The two resemble each other in
general appearance in the field, being relatively large but
delicate in structure. They differ in that the rhizome of A.
nodosum is more compact and the pinnule margins less
deply crenate than those of A. pseudocajennense.

Cárdenas & al. (2007) referred to Adiantum nodosum
as “Adiantum sp. 2.”

Adiantum pseudocajennense J. Prado, R. Y. Hirai & A.
R. Sm., sp. nov. — Fig. 3.

Holotype: Ecuador, Napo, Yasuni National Park, km 32
of oil road, mature forest in the floodplain of Rio Ti-
putini, a swamp dominated by Mauritia palms, 00°36'S,
76°27'W, 200–300 m, 14 Apr 1997, H. Tuomisto,
S. Markkanen, K. Ruokolainen & R. Montufar 10591
(UC barcode UC1788278; isotypes: QCA 2 sheets,
QCNE 2 sheets, SP, TUR 3 sheets).

Morphological description — Plants terrestrial. Rhi-
zomes long-creeping, slender, 1–2 mm in diam.,
sparingly scaly, with stipes 2–3.3 cm apart, scales light
brown, shiny, linear-lanceolate, base pectinate, margin
entire. Fronds 23–66 cm long, maximally to 1.3 m; stipe
black, 0.5–1 x as long as frond, adaxially sulcate, very
sparingly scaly, scales appressed throughout, light brown,
concolorous, filiform, c. 1 mm long, base with several
processes, margin ciliate near base; also with arachnoid
classes c. 0.5 mm long; lamina 2-pinnate, not reduced at
base, 20–40 cm wide; rachis with indumentum similar
to that of stipe, but more dense; pinnales elliptic, slightly
narrowed at base, tapering at apex, 9–25 x 2.5–3 cm,
indumentum of pinna rachis like that of main rachis;
lateral pinnae in 1–7 pairs (5–7 pairs in fertile fronds,
fewer than 5 in sterile fronds), alternate, oblique; terminal
pinna conform, 1–1.2 x as long as subtending pinnae;
pinnules in 11–35 pairs, not articulate, oblique to pinna
rachis, 2–3 x as long as wide, papyraceous, adaxial sur-
face glabrous, abaxial surface very sparsely scaly, scalesorne on veins at pinna base, light brown, 0.5–1 mm
long, base pectinate, apex filiform; pinnules free-veined,
without evident midrib, veins slightly prominent,
with oblique idioblasts present between veins adaxially;
proximal pairs of pinnules reduced, somewhat delinate;
medial pairs dimidiate, almost trapeziform, acrosopic
base rectangular, sterile margins irregularly crenately
lobed, sterile apices obtuse, straight or curved toward
pinna apex, fertile apices angular; distal pinnules c. ½ or
less length of medial pinnules; terminal pinnule on each pinna slightly pinnatifid, larger than distal ones. *Sori* mostly 1–3 per pinnule, oblong; *indusia* light brown, glabrous, margin entire; *spores* not seen.

*Distribution and ecology* — Endemic to Amazonian Ecuador (Fig. 1). Occurring in swamp forests dominated by *Mauritia* L. f. palms and in floodplain forests, usually on muddy sites, at 200–300 m.

*Etymology* — The specific epithet is based on the morphological similarity between the pinnules of this new species and those of *Adiantum cajennense* Willd. ex Klotzsch.
Additional specimens examined — ECUADOR: NAPÓ: Laguna de Yuturi, Bosque húmedo tropical, sendero hasta el moretal, 00°36'S, 76°13'W, 220 m, J. Jaramillo & E. Grijalva 11308 (QCA); idem, Yasuní National Park, 94.9 km along oil road, 00°54'S, 76°13'W, 200–300 m, 24 Feb 1998, H. Tuomisto & K. Ruokolainen 11476 (QCA 3 sheets, QCNE, SP, TUR 3 sheets); idem, Yasuní National Park, km 32 of oil road, mature forest in floodplain of Río Tiputini, 00°36'S, 76°27'W, 200–300 m, 13 Apr 1997, H. Tuomisto & al. 10589 (QCA, QCNE, SP, TUR); idem, Yasuní National Park, about 1.5 km E of bridge over Río Tiputini E of biological station, 00°40'S, 76°23'W, 220 m, 11 Apr 1996, R. C. Moran & al. 6089 (TUR 2 sheets); idem, Parque Nacional Yasuní, 3 km E of bridge over Río Tiputini E of research station, 00°45'S, 76°27'W, 200 m, 19 Apr 1996, R. C. Moran & al. 6239 (TUR).

Diagnostic features — Adiantum pseudocajennense is easily recognized by having rhizomes long-creeping, slender, 1–2 mm in diam., with fronds 2–3.3 cm apart; margins of sterile pinnules irregularly crenately lobed; pinnules almost glabrous abaxially; laminar scales concentrated near base of pinnules, petioles and rachises, with few sparse, filiform plus arachnoid scales; and indusia glabrous.

Adiantum pseudocajennense typically grows on very wet soil in floodplain and swamp forests, and the long-creeping rhizomes allow it to spread vegetatively such that it often sparsely covers relatively large patches.

The most similar species is Adiantum cajennense, which occurs widely in the Amazon Basin. The similarity is indicated by the sterile margins of the crenately lobed pinnules in both species. However, A. cajennense differs by its short-creeping and stout rhizomes (5–8 mm in diam.) and pubescent indusia. Additionally, in A. cajennense the stipes and rachises are generally densely scalyi. Ecologically the two species are clearly distinct, as A. cajennense grows in well-drained sites rather than in swamps.

Tuomisto & al. (2002) referred to Adiantum pseudocajennense as “Adiantum sp. 2”.

Acknowledgements

The authors thank Samuli Lehtonen for sending images of some specimens at TUR and Klei Sousa for preparing the line drawings. Michel Boudrie, Brigitte Zimmer and an anonymous reviewer are also thanked for their comments on an earlier version of this paper.

Wildenowia

Open-access online edition www.bioone.org/loi/will  BioOne
Online ISSN 1868-6397 · Print ISSN 0511-9618 · Impact factor 0.680
Published by the Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin
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References


Linnaeus C. 1753: Species plantarum. – Holmiae: Laurentii Salvii.


