



Original Article

The Fern Genus *Arachniodes* (Dryopteridaceae): A New Record for the Flora of Vietnam

Vu Phuong Linh¹, Nguyen Trung Thanh^{1,*}, Doan Hoang Son², Lu Thi Ngan³

¹VNU University of Science, 334 Nguyen Trai, Hanoi, Vietnam

²Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam.

³Vietnam National Museum of Nature, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam

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Abstract: This paper presents a new record of the fern genus *Arachniodes* Blume from Vietnam, *Arachniodes simplicior*. The paper provides a detailed description of the new species based on the traditional morphological method, of which micro morphological characters of spores were firstly described based on the specimens collected from Quang Binh (Minh Hoa district), Vietnam. In addition, type materials of *A. simplicior* were analyzed and a specimen from MAK (MAK012702) was designated as a lectotype.

Keywords: *Arachniodes simplicior*, Dryopteridaceae, new record, flora of Vietnam.

1. Introduction

The genus *Arachniodes* Blume (Dryopteridaceae) is one of the most confusing and controversial fern genera in terms of circumscription, nomenclature, and taxonomy. It is a pantropical genus commonly distributed in subtropical and tropical forest regions of the world, mainly (abundant) in China and southern and southeastern Asia [1] with 60 species (PPGI - 2016) [2]; in Kew Science (Plants of the world

online) [3] listed 67 accepted species and 14 hybrids while the most recently study by Lu et al. in 2018 showed that the genus contains about 83 species worldwide [4]. China is considered as one of the most diversity centers of *Arachniodes* with 40 species are recorded [5]. In Vietnam, the number species of the genus has more than double since Pham and Phan studied of two decades ago [7,8]. There are 11 species have listed by Phan in 2010 [6] and not include

* Corresponding author.

Email address: thanhntsh@gmail.com

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Arachniodes simplicior. Three new species of *Arachniodes* were added for the flora of Vietnam by Lu et al., 2018 [9], those new findings have increased the number species of the genus *Arachniodes* for Vietnam to 14 spp. In early 2020, while revising a taxonomy of this genus in Vietnam, *Arachniodes simplicior* has been recognized from the specimens collected in Quang Binh prov. (Minh Hoa distr.) of Vietnam. Previously, its distribution has been known only in China North-Central, China South-Central, China Southeast, Japan and Korea [3]. In this paper, *A. simplicior* is described as a new species record for the flora of Vietnam. The general morphological and spore characteristics, a lectotypification of *A. simplicior* are also will be presented in this study.

2. Materials and Methods

Material: Morphological study is based on specimens collected in the field and stored at Vietnam National Museum of Nature (VNMN). Online specimens and syntypes of species were also examined.

Method: We have applied the literature reviews plus morphological comparison method association with scanning electron microscopy (SEM) to observe microstructural features (spore morphology) in this study. The SEM equipment, namely Hitachi TM0101 located in VNMN.

3. Result and Discussion

Taxonomic treatment:

Arachniodes simplicior (Makino) Ohwi, Journal of Japanese Botany (J. Jap. Bot.) 37 (3): 76. 1962. Basionym: *Aspidium aristatum* var. *simplicior* Makino, Botanical Magazine (Bot. Mag.), Tokyo 15(170): 65-66. 1901. (Fig.1)

Type: -JAPAN. Tosa Province (Kōchi Prefecture): Takaoka-gori, 1884, *T. Makino s.n.* (lectotype, designated here: MAK: MAK012702! (Fig. 2), isolectotypes: TI:

TI00010763!, MAK: MAK012700!, MAK012701!, MAK012703!).

Description (mainly based on Zhang and Lu 7461):

Plants 58-107 cm tall. Rhizomes short creeping and covered with densely scales; scales on rhizomes dark-brown, linear-lanceolate, 0.5-0.8 cm long, membranous, entire, gradually narrowed and short tortuous at the apex. Stipe 28-55 cm × 2-4 mm, straw to dark brown at base, scattered scales along stipes and rachises, scales on stipe base look like those on rhizomes, but slightly narrower, 0.4-0.6 cm long. Lamina 2 to 3-pinnate, abaxial pale green and adaxial shiny pale green when dried, ovate, sometimes pentagonal, 30-52 × 13-22 cm, papery, base cordate-subtruncate, apex abruptly caudate (sudden decrease at apex) and elongated acute, somewhat with a stalked conform terminal pinna, often 3 pairs of pinnae, alternate, sometimes opposite, distance between the lowest pinnae to the next adjacent pinnae 4 to 6 cm, between 2 alternate pinnae 0.1-1.1 cm; the lowest pinnae elongated at base, larger than the others, obliquely deltoid, 15-20 × 7-9 cm, 0.8-1.2 cm stalk, base broadly rounded, or cordate, apex acuminate, the upper pinnae base cordate, rounded-truncate, apex acuminate, middle pinnae lanceolate, 20 × 5 cm; Pinnules 8-10 pairs, 2 × 0.7 cm, oblong-lanceolate, base aboard cuneate, apex obtuse with margin aristate, lobed 1/3-1/4 toward costae. Sori orbicular, distributed in the middle of veinlet and margin or sub margin, 2-6 pairs divided in 2 rows on the pinnules, reddish brown; indusia orbicular-reniform, membranous, entire, persistent attached to veinlet; spore ellipsoidal, 33-40 μm, irregularly inflated, sparsely echinulate folds.

Taxonomic notes: 1.- Phylogenetically, this species is nested to a clade containing nine other different accessions named *A. simplicior* from result of Lu et al. [4] and this species is notorious for the variation in some morphological characters. That why, it is not a surprise that in comparison to Chinese *A. simplicior*, the Vietnamese specimens more obtuse and oblong

pinnule apices; **2.-*Arachniodes simplicior*** is most similar to *A. chinensis* (Rosenstock 1914: 130) [10] Ching (1962: 257) [11] in having lanceolate scales at stipe bases and long filiform scales on rachis, lamina apex abruptly caudate with a stalked conform terminal pinna, but the new reported species has dark-brown scales, lowest pinnae obliquely deltoid, lamina ovate, papery, whereas *A. chinensis* has blackish scales, lanceolate-oblong pinnae, lamina narrower, ovate-oblong and thicker.

Nomenclature note: When Makino (1901: 65-66) described *Aspidium aristatum* var. *simplicior*, five gatherings (*T. Makino s.n.*, 1884; *T. Makino s.n.*, 1889, *Y. Yoshinaga s.n.*, *Z. Umemura s.n.*, 1896, *Z. Umemura s.n.*, 1895) were cited in the protologue but no holotype was designated. When studying those specimens (syntypes), we designated the sheet MAK012702 as the lectotype.

Distribution and habitats: Korea (Hongdao), China (Guangxi, Guizhou, Yunnan), Japan (Tosa, Iyo, Ise) and Vietnam (Quang Binh). It grows well in warm temperate and tropical areas. In Vietnam, found several individuals in one place only and preferred acidic soils among limestone rocks.

Additional specimens examined: Vietnam: Quang Binh province, Minh Hoa district, Hoa Son commune, Hoa Luong village, 17°46'55.76" N 105°53'0.70"E, a limestone mountain opposite of the forest station at elev. 600m, 15 November, 2014, *Zhang and Lu 7461* (VNMN).

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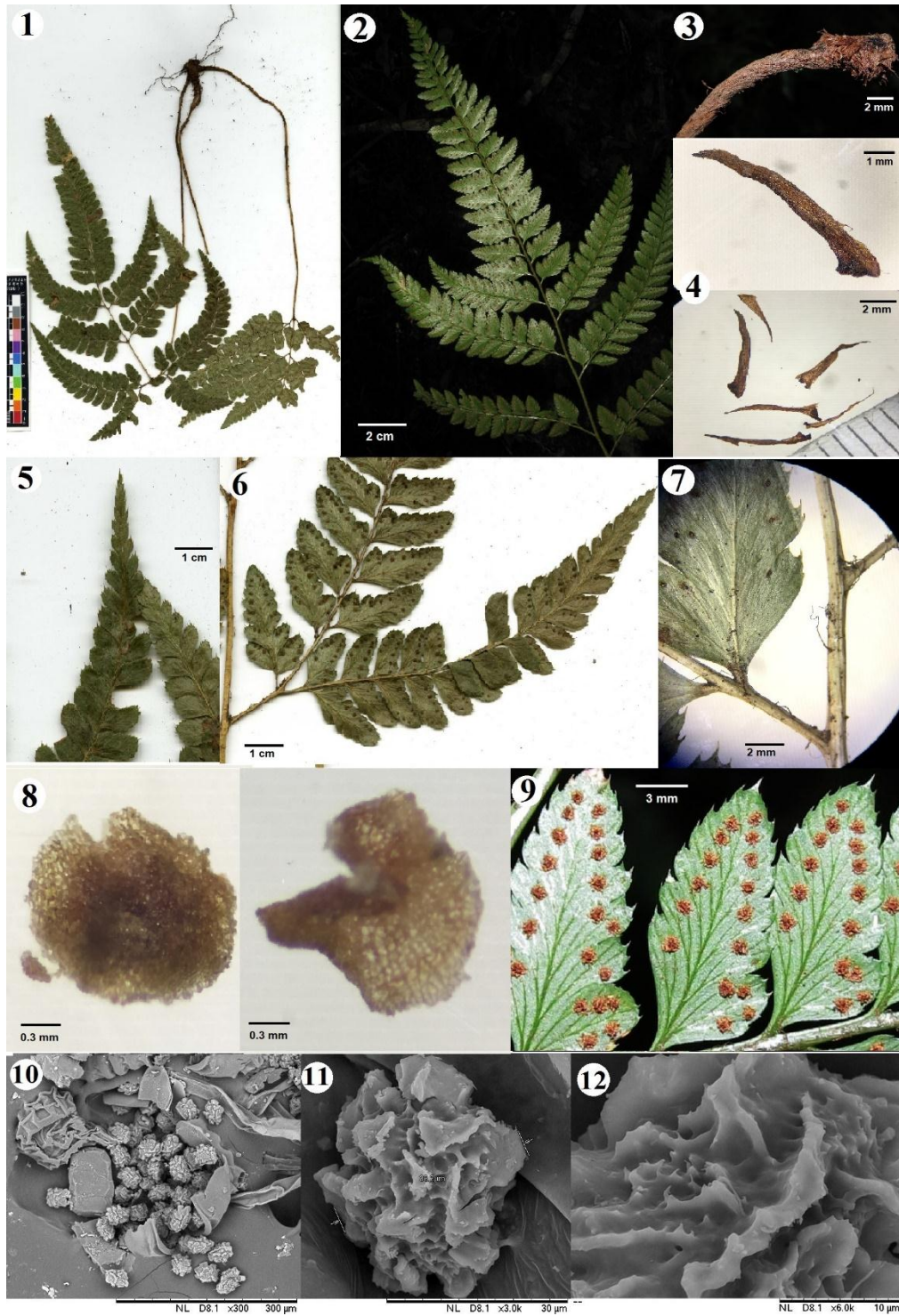


Figure 1. 1. The scan of whole plant. 2. Apex. 3. Base of stipe shows scales. 4. Rhizome and base stipe scales. 5. Part of pinnae. 6. The lowest pinnae. 7. Part of rachis and pinnule. 8. Entire indusia. 9. Pinnules show sori position and margin. 10-12. Spores by Scanning Electron Microscope (SEM).



Figure 2. Lectotype of *Arachniodes simplicior* (Makino) Ohwi.X.