TRƯỜNG ĐẠI HỌC SƯ PHẠM TP HỒ CHÍ MINH
TẠP CHÍ KHOA HỌC
KHOA HỌC TỰ NHIÊN VÀ CÔNG NGHỆ
ISSN: 1859-3100
Tập 15, Số 3 (2018): 129-138

HO CHI MINH CITY UNIVERSITY OF EDUCATION
JOURNAL OF SCIENCE
NATURAL SCIENCES AND TECHNOLOGY
Vol. 15, No. 3 (2018): 129-138

Email: tapchikhoahoc@hcmue.edu.vn; Website: http://tckh.hcmue.edu.vn

NEW DISTRIBUTIONS OF THREE AROIDS IN SOUTHERN VIETNAM

Văn Hồng Thiện [1*], Nguyễn Phi Ngà [2], Lưu Hồng Trường [3]

[1] Institute of Biotechnology and Food Technology - Industrial University of Ho Chi Minh City

[2] Department of Ecology and Evolutionary Biology - University of Science - Vietnam National University

[3] Southern Institute of Ecology - Vietnam Academy of Science and Technology.

Received: 21/8/2017; Revised: 14/12/2017; Accepted: 26/3/2018

ABSTRACT

Two species of the Araceae are recorded for the first time in southern Vietnam, namely Amorphophallus paeoniifolius Nicolson in Phuoc Binh National Park (Ninh Thuan province) and A. tonkinensis Engl. & Gehrm. in Kon Ka Kinh National Park (Gia Lai province). Meanwhile, we have successfully located the distribution of Homalomena pierreana Engl. & K. Krause in Phu Quoc National Park (Kien Giang province).

Keywords: *Amorphophallus paeoniifolius, Amorphophallus tonkinensis, Homalomena pierreana*, southern Vietnam.

TÓM TẮT

Ghi nhận vùng phân bố ở khu vực phía Nam Việt Nam cho ba loài thuộc họ Ráy (Araceae)

Ba loài thuộc họ Ráy trước đây chỉ được ghi nhận ở khu vực phía Bắc hoặc ở phía Nam Việt Nam, nhưng chưa biết rõ vị trí thì nay được ghi nhận thêm hoặc xác nhận chính xác vị trí phân bố ở các khu vực phía Nam. Theo đó, loài Amorphophallus paeoniifolius Nicolson được ghi nhận ở Vườn quốc gia (VQG) Phước Bình (Ninh Thuận), A. tonkinensis Engl. & Gehrm, có ở VQG Kon Ka Kinh (Gia Lai) và Homalomena pierreana Engl. & K. Krause có ở VQG Phú Quốc (Kiên Giang).

Từ khóa: *Amorphophallus paeoniifolius, Amorphophallus tonkinensis, Homalomena pierreana*, miền Nam Việt Nam.

1. Introduction

The Araceae in Vietnam was first systemized by the French botanist Gagnepain in 1942 [4]. Pham-Hoang (2000) [8] and Nguyen (2005) [6] provided the national checklist of

* Email: *vanhongthien2014@gmail.com*

aroid species with brief description. Most recently, in his doctoral thesis, Nguyen (2006) [7] updated the checklist with 116 species belonging to 23 genera in Vietnam. However, the exact distribution of several species has been unclear, especially for southern Vietnam.

Homalomena includes many medicinal species used in folk remedies for treatment of numbness, aches and pains, etc., such as *H. cochinchinensis* or *H. occulta* in Vietnam [8]. Among *Homalomena* species, *H. pierreana* is reportedly distributed in southern Vietnam [3, 6-9] without exact location.

In Vietnam, the genus *Amorphophallus* has 40 species, 24 of which are reported to occur in southern Vietnam. *A. tonkinensis* is known as endemic to northern Vietnam. Having subcosmopolitan distribution with most abundance and diversity in the everwet or humid tropics, *A. paeoniifolius* is known to occur in Vietnam but surprisingly none of its specimens have been collected in the country's southern part [6-10].

This article is part of a series of scientific papers resulting from the first author's doctoral dissertation on the Araceae in southern Vietnam. Here, we reported additional information on the distribution of the mentioned three species in the southern part of the country.

2. Materials and methods

2.1. Materials

Samples of the three taxa were collected from southern regions of Vietnam: *Amorphophallus paeoniifolius* in Phuoc Binh National Park (Ninh Thuan province), *A. tonkinensis* in Kon Ka Kinh National Park (Gia Lai Province) and *Homalomena pierreana* in Phu Quoc National Park (Kien Giang province). All vouchered specimens are deposited at SGN (herbarium of the Southern Institute of Ecology, Vietnam Academy of Science and Technology) and PHH (herbarium of the University of Science, Vietnam National University Ho Chi Minh City).

2.2. Methods

Specimens were sampled and processed using conventional methods guided by the Royal Botanic Gardens, Kew [1]. Detailed photos of taxonomically important characters of the species were taken using digital camera and fresh materials in the field.

We examined aroid specimens housed at SGN, HN, HNU and VNM. Digital images of related taxa at P and K [11-12] were also consulted.

Species identification was done using morphological vegetative and reproductive characters [6-9].

3. Results

3.1. ***Homalomena pierreana*** Engl. & K. Krause, 1912. Pflanzenr. Arac. 75 (IV. 23Da): 34, fig. 13. (Figure 1).

Medium-sized, evergreen, ca 10 cm tall. Stem 8–14 cm long, 1,5–2 cm in diameter. Leaves 6–8; petiole 10–15 cm long, 0,4 cm in diameter, green-grey. Leaf blade 8–10 cm long, 3–5 cm wide, triangular or hastate, apex cuspidate, dark green adaxially, pale green abaxially, midrib impressed adaxially and prominent abaxially, lateral veins diverging from the midrib and then towards leaf margin. Inflorescences 2–5; peduncle much shorter than petiole, 4–5 cm long, 5 mm in diameter, grey to brown. Spathe longer than spadix, green at young, pale yellow at anthesis, elliptical, apex cuspidate. Spadix shorter than spathe, 2,5–3 cm long, conical, white-green; female part 8 mm long, cylindrical; ovaries bottle-shaped, 3-loped, pale green, ca. 2 mm tall, ca. 1 mm in diameter, ovules hemianatropous, many; staminode white, subcylindrical to slightly clavate; style 0,5 mm long; stigma globose, 0,5 mm in diameter, pale green. Male part 2–2,5 cm long, conical, apex cuspidate, density arranged, anthers dehiscent by long slits at apex.

Type: Pierre sine num (P, isotype), Cochinchina.

Ecology: Growing on rock along streams under moist evergreen forest.

Studied specimens: Van Long Ha and Hong Thien Van H.T. Van 108 (SGN!), Phu Quoc National Park, Kien Giang Province, 14 August 2015, about 10°21'01"N; 103°06'52"E, 83 m in elevation; *Pierre sine num* (P!, seen images), Cochinchina [12]; *Pierre sn. (*K!, seen images), Cochinchina [11].

Distribution: H. pierreana was first described by Engler & Krause (1912) [3] with the specimen recorded in Indochina. However, in Vietnam, according to Pham-Hoang (2000) [8] and Nguyen (2005 & 2006) [6-7], *H. pierreana* has the distribution region in southern Vietnam but the exact location has not been known. In addition, during the direct observation of specimen collections of Araceae in Vietnam (HN, HNU, PHH, VNM and SGN), we confirmed that there was no *H. pierreana* specimen in those collections. Therefore, our record confirms the exact location of the species.

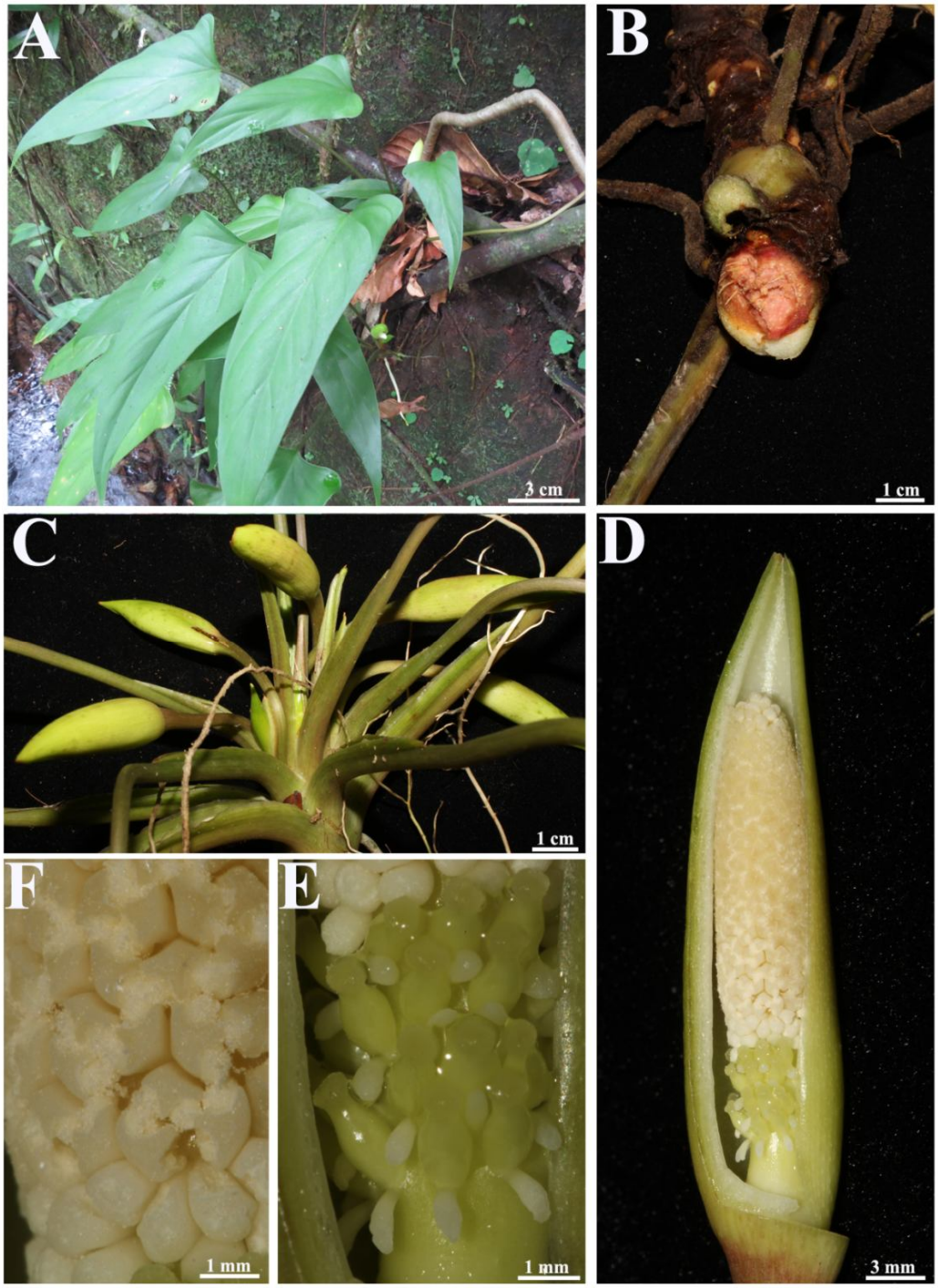

Figure 1. *Homalomena pierreana. A: Habitat and leaf blade. B: Stem. C: Spathe. D: Spadix. E: Female part of spadix. F: Stamen. Photo: A: Van Long Ha, B-H: Hong Thien Van*

3.2. Amorphophallus paeoniifolius Nicolson, 1977. Taxon 26: 337. (*Figure* 2)

Tuberous herbaceous plant, 1,6 m tall, tuber depressed globose, 20–30 cm in diameter, 14–18 cm tall. Leaf solitary, petiole 1,2–1,6 m long, 5–7 cm in diameter, pale green with many dark green dots; leaf blade trifoliolate, ca. 1.5 m in diameter; secondary leaflets lobated 2-3 times forming small laminae; laminae elliptical, 18–22 cm long, 4–6 cm wide, dark green adaxially, pale green abaxially, midrib impressed adaxially and prominent abaxially, lateral veins diverging from the midrib and collective vein at ca. 3 mm from margin. Inflorescence solitary. Peduncle 12–14 cm long, often entirely subterranean, 5–6 cm in diameter, pale yellow with white dots. Spathe longer than spadix, tube and limb often separated by a shallow constriction; spathe tube obconical, 14–16 cm long, 5–6 cm in diameter at base, 12–14 cm in diameter at apex; grey-yellow with many white dots outside, purple inside; spathe limb spreading, strongly undulate, 7–8 cm long, 16–18 cm in diameter, green-grey with many white dots outside, dark purple inside. Spadix sessile, shorter than spathe, 22–25 cm long; female part cylindrical, 7–9 cm long; male part obconical, 5–7 cm long, 4–5 cm in diameter at base, 7–9 cm in diameter at apex. Ovaries globose, ca. 3 mm in diameter, 2 mm tall, pale purple, 1 ovule, pale yellow; style 1,2–1,4 cm long, dark purple; stigma 2-lobed, yellow, verruculate, 3–3,5 mm in diameter. Staminate flowers loosely arranged, anthers dehiscent by long slits at apex. Appendix conical, very dark purple, 2–14 cm long, 17–19 cm in diameter at base, 6–8 cm in diameter at apex.

Type: Mulen-Schena Rheede, Hort. Malab. 11, t. 19. 1692.

Ecology: Secondary forest or highly disturbed areas. Flowering in May and fruiting in June.

Studied specimens: Hong Thien Van H.T.Van 76 (SGN!), Phuoc Binh National Park, Ninh Thuan Province, about $11^058'46"$N; $108^045'06"$E, 275 m in elevation, 26 May 2015; *Phương 3560* (HN!), Ha Long, Quang Ninh province, 21 August 2002; *Kerr 12824* (K!, seen images), Thailand, 08 May 1927 [11]; *Kerr 12824* (P!, seen images), Thailand, 08 May 1927 [12].

Distribution: A. paeoniifolius was first described by Nicolson (1977) [5]. In Vietnam, *A. paeoniifolius* has been only recorded in the northern regions, including Tuyen Quang, Lang Son, Bac Kan, Quang Ninh, Hoa Binh, Ninh Binh, Thanh Hoa and Hue [6-8]. In this paper, we reported *A. paeoniifolius* in Phuoc Binh National Park, Ninh Thuan Province.

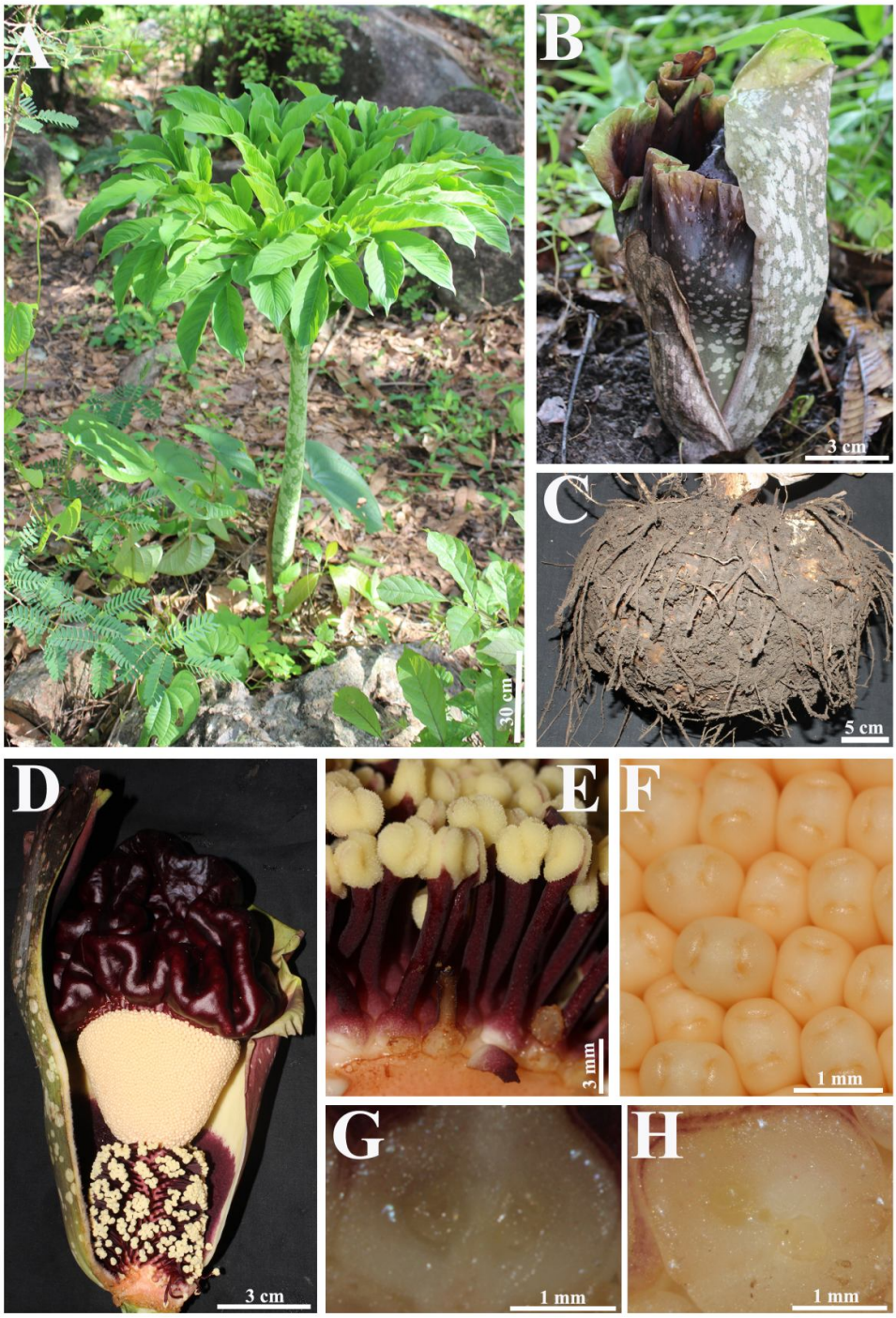

Figure 2. *Amorphophallus paeoniifolius. A-B: Habitat, Leaf blade and spathe. C: Tuber. D: Spadix. E: Stigma and style. F: Stamen. G: Longitudinal section of ovaries. H: Cross section of ovaries. Photo: Hong Thien Van*

3.3. Amorphophallus tonkinensis Engl. & Gehrm. 1911. Pflanzenr. 48 (IV. 23 C): 87. (Figure 3)

Tuberous herbaceous plant, 80–90 cm tall, tuber globose, 12–14 cm in diameter, 6–7 cm tall. Leaf solitary, petiole 70–80 cm long, ca.3 cm in diameter, green with many dark white dots; leaf blade trifoliolate, ca. 1 m in diameter; secondary leaflets lobated 1 time forming small laminae; laminae oblong, 10–20 cm long, 4–6 cm wide, apex acuminate with up to 2 cm, dark green adaxially, pale green abaxially, midrib impressed adaxially and prominent abaxially, lateral veins diverging from the midrib and collective vein at ca. 2 mm from margin. Inflorescence solitary. Peduncle 22–26 cm long, ca.1 cm in diameter, grey at base, pale green with many white dots at apex. Spathe as long as spadix, 8–10 cm long, 3–4 cm wide, green on both sides, elliptical. Spadix sessile, 8–10 cm long; female part cylindrical, 2–3 cm long; male part cylindrical, 2–3 cm long, anthers dehiscent by long slits at apex. Ovaries globose, ca. 2 mm in diameter, 1.5 mm tall, pale green, 1 ovule, white; style ca. 1–1.5 mm long, green-white; stigma light yellow, 2 to 4-lobed, ca. 1,5 mm in diameter. Appendix slightly ovoid to conical, cream, ca. 10–15 cm long, ca. 3–6 cm in diameter at base.

Type: Bon 3480 (P, holotype); *Balansa 2069* (K, isotype), Ke So, Kien Khe, Nam Ha, Vietnam, 13 May 1887.

Ecology: Growing on humid soils under evergreen forest.

Study specimens: Tam Ai Nguyen & Hong Thien Van H.T.Van 72 (SGN!), Kon Ka Kinh National Park, Gia Lai Province, about $14^0 10' 23'' N$; $108^0 22' 14'' E$ in elevation 860 m, 19 April 2015, *N.V. Du 95* (HN!), Cao Bang; N.T Hiep 278 *et al.* (HN!), 28 March 2001, Hoa Binh Province; P.K. Loc 043 (HN!), 15 March 2001, Thai Nguyen Province; *Bon 3480* (P!, seen images) [12]; *Balansa 2069* (K!, seen images) [11].

Distribution: A. tonkinensis is endemic to Vietnam and was first described by Engler and Gehrm. (1911) [3]. In Vietnam, according to Pham-Hoang (2000) [8] and Nguyen (2005 & 2006) [6-7], *A. tonkinensis* is distributed in the northern regions of Vietnam, including provinces of Cao Bang, Lao Cai, Tuyen Quang, Thai Nguyen, Quang Ninh, Vinh Phuc, Bac Can, Ha Tay, Hoa Binh, Ninh Binh, Thanh Hoa. During the field study, we found *A. tonkinensis* in Kon Ka Kinh National Park, Gia Lai Province.

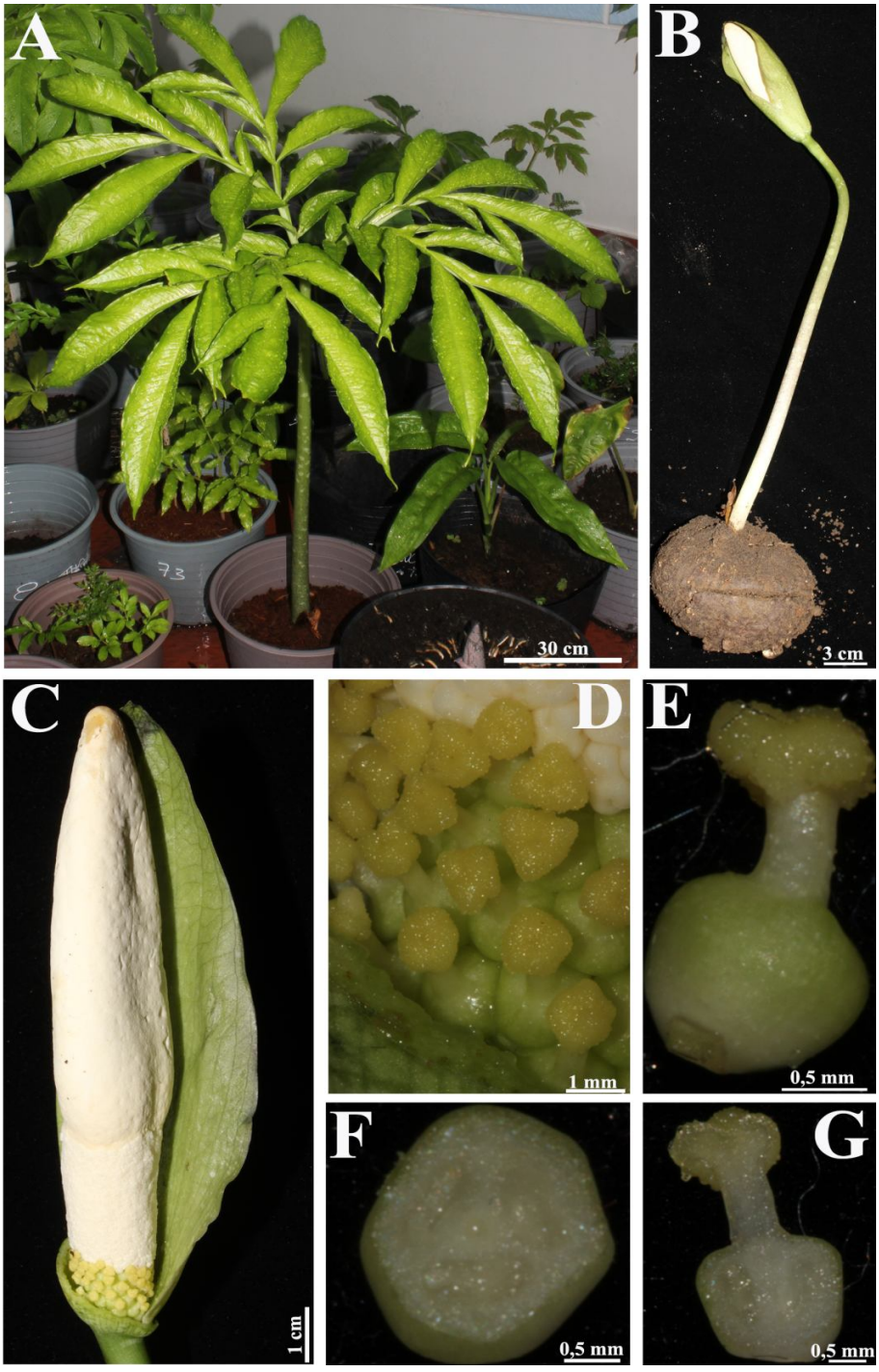

Figure 3. *Amorphophallus tonkinensis. A: Leaf blade. B: Tuber and inflorescence. C: Spadix. D: Stigma. E: Female flower. F: Cross section of ovaries. F: Longitudinal section of ovaries. Photo: Hong Thien Van*

4. Conclusion

Our own collections have ascertained the exact distribution location of *Amorphophallus paeoniifolius, A. tonkinensis* and *Homalomena pierreana* in southern Vietnam. This is the first time the first two species are reported to occur in the southern part. Relatively large populations of those species are seen in the national parks and thus they are well protected. These species should be further studied on their potential for food and medicine usages.

❖ ***Conflict of Interest:*** *Authors have no conflict of interest to declare.*

❖ ***Acknowledgment:*** *The authors would like to thank the staffs of the Southern Institute of Ecology, Vietnam Academy of Science and Technology for their valuable supports. We are grateful to the managers and staffs of the national parks of Phu Quoc, Kon Ka Kinh and Phuoc Binh for their permits and supports. Special thanks are to Mr. Ha Van Long (Phu Quoc National Park), Mr. Nguyen Thanh Binh and Mr. Nguyen Ai Tam (Kon Ka Kinh National Park) and Mr. Nguyen Hieu Cuong (Southern Institute of Ecology) for their help in the field. The work in Kon Ka Kinh was supported partially by the project "Databasing biodiversity of Kon Ka Kinh National Park" granted by the Gia Lai provincial Department of Science and Technology to the park.*

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