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Print & Online, Open Access, Research Journal Available on <http://jbsd.in>

ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)

Research Article



First record of *Curcuma sparganiifolia* Gagnep. (Zingiberaceae) from Vietnam

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Article Info

Received: 16-10-2018,

Revised: 28-11-2018,

Accepted: 06-12-2018

Keywords:

Curcuma gracillima,

Curcuma subgen.

Hitcheniopsis, New record, Vietnam, Zingiberaceae.

Abstract

Curcuma sparganiifolia is here reported for the first time from Phú Quốc National Park, Kiên Giang province, southwestern Vietnam. It was previously hitherto known as a native species in Cambodia and Thailand. *Curcuma sparganiifolia* is distinguished from *C. gracillima* by characteristics of the spike composes of some pink to pink-purple fertile bracts and no comma bracts, the connective tissue being glabrous, and the labellum is entire and yellow with red patch at the basal half. A full description, colour plates as well as data on distribution, habitat, phenology, conservation status, and notes on this species are given.

INTRODUCTION

The genus *Curcuma* L. is one of the largest genera in the tribe Zingibereae (Zingiberaceae). It includes approximately 108 recently accepted species (Leong-Škorničková *et al.*, 2015a) distributed throughout tropical Asia from India to South China, Southeast Asia, Papua New Guinea and northern Australia, with a centre of diversity is in monsoonal parts of Asia from India to Indochina (Larsen, 2005; Leong-Škorničková and Newman, 2015). The recent study on the phylogeny of the genus *Curcuma* (Záveská *et al.*, 2012) followed by nomenclatural amendments (Leong-Škorničková *et al.*, 2015a), three subgenera (*C.* subgen. *Curcuma*, *C.* subgen. *Hitcheniopsis*, and *C.* subgen. *Ecomata*) were proposed. In Vietnam, 14 species have been reported (Gagnepain, 1908; Phạm, 2000). In 2005, Nguyễn was listed 19 species of *Curcuma* in his checklist of Zingibereaceae of Vietnam. Recently, 10 species were described as new species and new

record for Vietnam (Leong-Škorničková *et al.*, 2010; Leong-Škorničková and Lý 2010; Leong-Škorničková and Luu, 2013; Leong-Škorničková and Trần, 2013; Leong-Škorničková *et al.*, 2014; Leong-Škorničková *et al.*, 2015a; Luu *et al.*, 2017; Nguyễn *et al.*, 2017).

During the medicinal plant investigations in Southwestern Vietnam in 2018, several interesting plants of a small *Curcuma* were found and collected in Phú Quốc Island, Kiên Giang Province where they grow in the *Melaleuca* forest, Phú Quốc National Park. Close examination with the help of literature and herbarium specimens reveal that those plants have been identified as *Curcuma sparganiifolia* Gagnep., which proved to be a new record for Vietnam. We here report the presence of *C. sparganiifolia* in Vietnam and provide a description, a color plate and distribution map of this species based on our collections.

MATERIALS AND METHODS

All measurements and descriptions were made from mature and living plants, herbarium specimens and spirit material preserved in 70% ethanol from Vietnam. The cited specimens were preserved in the herbarium of National Institute of medicinal materials (NIMM) and the VNM herbarium, Institute of Tropical Biology. The identification and distribution of the collected *C. sparganiifolia* specimens were insured through the major digital herbaria web site AAU, E, K, HN, LE, P, SING, VNM and VNMV as well as JSTOR Global Plants (<https://plants.jstor.org/>). Protolques and related literatures of all related taxa (e.g. Gagnepain 1903, 1908; Schumann 1903; Pham 2000; Nguyễn 2005) were also examined. The preliminary IUCN assessment is based on the criteria given in IUCN version 3.1 (2012).

TAXONOMIC TREATMENT

Curcuma sparganiifolia Gagnep., Bull. Soc. Bot. France 49: 260 1903. Schumann K. 1903. Zingiberaceae in: Engler A. Das pflanzenreich. Leipzig, Verlag von Wilhelm Engelmann. Hel. 20: 104; Fl. General Indo. Vol 6, p59 (1907). *Hitcheniopsis sparganiifolia* (Gagnep.) Loes., *Nat. Pflanzenfam., ed. 2 [Engler & Prantl] xv a. 572* (1930). Figures 1 & 2.

Type: Cambodge, L. Hahn N°30, à Tiak-Kol (Kampol), 27 octobre, en fruits, vulgairement "Chauk rat prey" (holotype: P, barcode P032683!, isotype: P, barcode P00686565!, P00686566!, P00710485!)

Rhizomatous herb, 40–55 cm tall. *Rhizome* subglobose to ovoid, 1.4–1.5 × 1.2–1.5 cm, externally pale yellow, but covered in rusty colored decayed scales, internally pale yellow, root tubers ovoid to obloid-ovoid, 1.7–4 × 1.2–1.5 cm, placed close to the rhizome to 1 cm long, externally pale brown, internally white. *Pseudostem* up to 20 cm long, composed of 3–5 leafless sheaths, the outer ones 2–2.9 × 1.5–1.7 cm, the inner ones 7–17.7 × 1.4–1.5 cm, white at base, red-purple to purple distally, apex short acute, greenish, glabrous; 2-leaf sheaths, 17–20 cm long, white at base, green to purplish-green distally, glabrous; ligules oblong-ovate, 3.5–4.5 × 3.5–4 mm, bilobed, membranous, hyaline, glabrous. *Leafy shoot* with 2 leaves at flowering; petiole 7–11 cm long, green, glabrous; lamina narrowly elliptic-linear, 21–26.5 × 2.1–3.3 cm, glabrous on both sides, adaxially green to dark

green, abaxially light green, margin hyaline, glabrous, apex attenuate, base narrowly attenuate. *Inflorescence* central; peduncle 28.8–38 × ca. 0.2 cm long, basally hidden between the leaf sheaths; *spike* 4.5–66 × 4–4.8 cm, composed of 12–16 fertile bracts, comma absent; bracts almost oblong to oblong-obovate, apex rounded, curved outwards or slightly oblique, lower bracts 2.1–2.8 × 1.6–1.8 cm, gradually smaller towards the top, 2–2.1 × 0.8–1.1, bright pink with a green patch at apex, glabrous, connate to one another near the base, apex rounded. *Cincinni* with 3 flowers at the base of the inflorescence, the number gradually decreasing upwards. *Bracteoles* minute, one per flower, ovate, 4–5 × 2.5–3 mm at base, hyaline, translucent-white, glabrous. *Flowers* 1.7–1.8 cm long, slightly exerted from bracts. *Calyx* 4.5–5 × c. 2.5 mm long, 3-lobed, with an unilateral incision ca. 2 mm long, white, glabrous. *Floral tube* 7–8 mm long, ca. 2 mm wide broadest part, narrowly cylindrical and funnel-shaped towards the top, externally white, glabrous, internally white, glabrous, sometimes puberulous in apical part; dorsal corolla lobe oblong-elliptic, 6–6.2 × 3–3.3 mm, white, glabrous, apex rounded, slightly concave; lateral corolla lobes 5.7–6 × 2.9–3mm, oblong-elliptic, glabrous, white, apex rounded, slightly concave; labellum oblong-obovate, 6.2–7 × 4–4.5 mm, apex slightly hooded and rounded, margin slightly emarginated, pale to dark red with bright yellow patches on the bright red swollen band at the base half of the labellum, yellow towards the apex. *Stamen* with a slightly versatile anther, filament 2–2.2 × 1.8–2.1 mm, white, glabrous; anther spureless, narrowly ovate, 3–3.2 × 1.7–2 mm, connective tissue white, with slightly glandular hairs on sides and back, anther thecae ca. 2.8–3 × ca. 1 mm long, white, dehiscing along their entire length; anther crest present, ca. 1.5 mm long, obtuse, glabrous. *Style* filiform, 14–15 mm long, glabrous. *Stigma* unequally funnel shaped, 1.2–1.5 × ca. 0.5 mm, white, ostiole glabrous but minutely irregularly serrulate. *Epigynous glands* absent. *Ovary* slightly obovoid, ca. 2 × 1.5 mm, greenish, trilocular, glabrous, slightly aromatic. *Fruits* and seeds not seen.

Specimen examined: Vietnam, Phú Quốc District, Bãi Thơm Commune, Phú Quốc National Park, Đòng Tràm, 31 m a.s.l., 25 March 2018, Cao Ngọc Giang, Hà Văn Long, Lý Ngọc Sâm, Trần Thị Liên, Trần Minh Ngọc TNB-042 (NIMM, VNM), TNB-043 (NIMM), and TNB-044(VNM).

Phenology: The plants were flowering March-May.

Habitat: *Curcuma sparganiifolia* grows in grassland areas and under canopy of the *Melelauca* forest on sandy soil, at 31 m elev.

Distribution: Cambodia, Thailand and Vietnam (Kiên Giang).

Conservation status: Globally Near Threatened (NT B2ab(v)) under the criteria set out in IUCN (2012) (Leong-Škorničková *et al.*, 2012). In Vietnam, only a single population consists of less than 100 mature plants in a total Area of Occupancy of less than 32 km² in Phú Quốc NP was so far observed. Although the locality has a certain degree of legal protection and no uses were reported by the local people, the species still faces some at extremely risk due to loss of the habitat within its range for tourist service. Based on currently available data we therefore provisionally assess this species as Critically Endangered (CR/D) in Vietnam according to the IUCN Red list criteria (IUCN, 2012).

Notes: *Curcuma sparganiifolia* is originally described from Tiak-Kol, Kampol (Kampot), Cambodia (Gagnepain 1903). It is also distributed to northeastern, eastern and southeastern Thailand (Sirirugsa *et al.* 2007). However, in Vietnam, according to Nguyễn (2005, 2011), *C. sparganiifolia* has the distributed region in Southern Vietnam based only on examination of the herbarium specimen collected by the French Botanist L. Pierre: “Chochichine, L. Pierre 6069 (LE)” but has not encountered this species in Vietnam, either in the field or in herbaria. Our examination of the herbarium materials of this species in the major herbaria listed above revealed that Pierre 6069 did not find at LE but two specimens of Pierre 606 were found at LE (barcode: LE01043517!) and P (barcode: P02184044!), respectively. The LE specimen consists of 3 flowering plants and a handwritten label in the lower left on which appears: “No. 606, Hab. Cochinchina ad montane Krevanh en prov. “Tpong?”, Cambodianum, Coll. L Pierre, 9/1870” while the P sheet with 3 flowering plants and a handwritten label shows as: “No. 606, Hab. Cochinchina ad basis montis Knang Kepoeu Cambodianum, Coll. L. Pierre, 8/1870”. Even though the locality information of the Pierre 606 sheets is not fixed but they evidence that the Pierre’s specimens were collected from Cambodia and Nguyễn works (2005, 2011) which added *C. sparganiifolia* to the flora of Vietnam based on the LE specimen were inaccurate.

Furthermore, while studying the herbarium specimens in P, it was revealed that there are two specimens of *C. sparganiifolia* collected from Muong-Man/Muong-man (Binh Thuan Province, Vietnam) in 1924 by Sallet (Legît D’= Sallet No. 1496, nom aun. le Nãi. Contre les maux de tête, fleur blanches striées larges de ½ cm, muong-man, 19 Octobre 1924, barcode: P02184046!) and Evrard (F. Evrard N° 1578, Forests à l’ouest de muong-man, 26 Octobre 1924, barcode: P02184045!). The Sallet’s specimen bears two flowering plants while the Evrard’s sheet consists of three maturity plants with the two flowering ones. Those plants are 3-4 somewhat lanceolate and glabrous leaf with inflorescence terminally and as ½ long as the leaf shoots, the spike composes of green bracts with several comma bracts white adaxially and the flowers are exerted with the deeply 2-lobed labellum in which those are more similar to *C. gracillima* Gagnep. than *C. sparganiifolia*. Although forests around Mùòng Mán have been clearly cut for agricultural lands and urban areas, however, several subpopulations of *C. gracillima* were found at Ta Kou Nature Reserve, Hàm Thuận Nam district, Bình Thuận province, about 18 km to Southeast Mùòng Mán by the fourth author in 2008 (Voucher specimens: Lý 308, VNM) where it grows in open areas and foothills in semi-evergreen forest dominated by Dipterocarps (Figure 3). It shows that the Sallet and Evrard’s specimens have been misidentified as *C. sparganiifolia*. In the present study, our herbarium study and field records indicate that those misidentified specimens have been determined as *C. gracillima*, a widely distributed species in Indochina to Thailand, while *C. sparganiifolia* is firstly reported for Vietnam from Phú Quốc Island, Kiên Giang province. Both species belong to *Curcuma* subgen. *Hitcheniopsis* by their flowers are lacking of epigynous glands and anther spurs (Schumman 1904; Závěská *et al.* 2012).

Curcuma sparganiifolia is similar to *C. gracillima* in general habit and vegetative characters but its inflorescence is somewhat as long as the leaf shoot, the spike composes of some pink to pink-purple fertile bracts and no comma bracts, the connective tissue being glabrous, and the labellum is entire and yellow with red patch at the basal half, which make it easy to distinguish from the later species by having the inflorescence is usually as ½ long as the leaf shoot, the spike consists of some green fertile bracts with well-developed white comma bracts, the connective

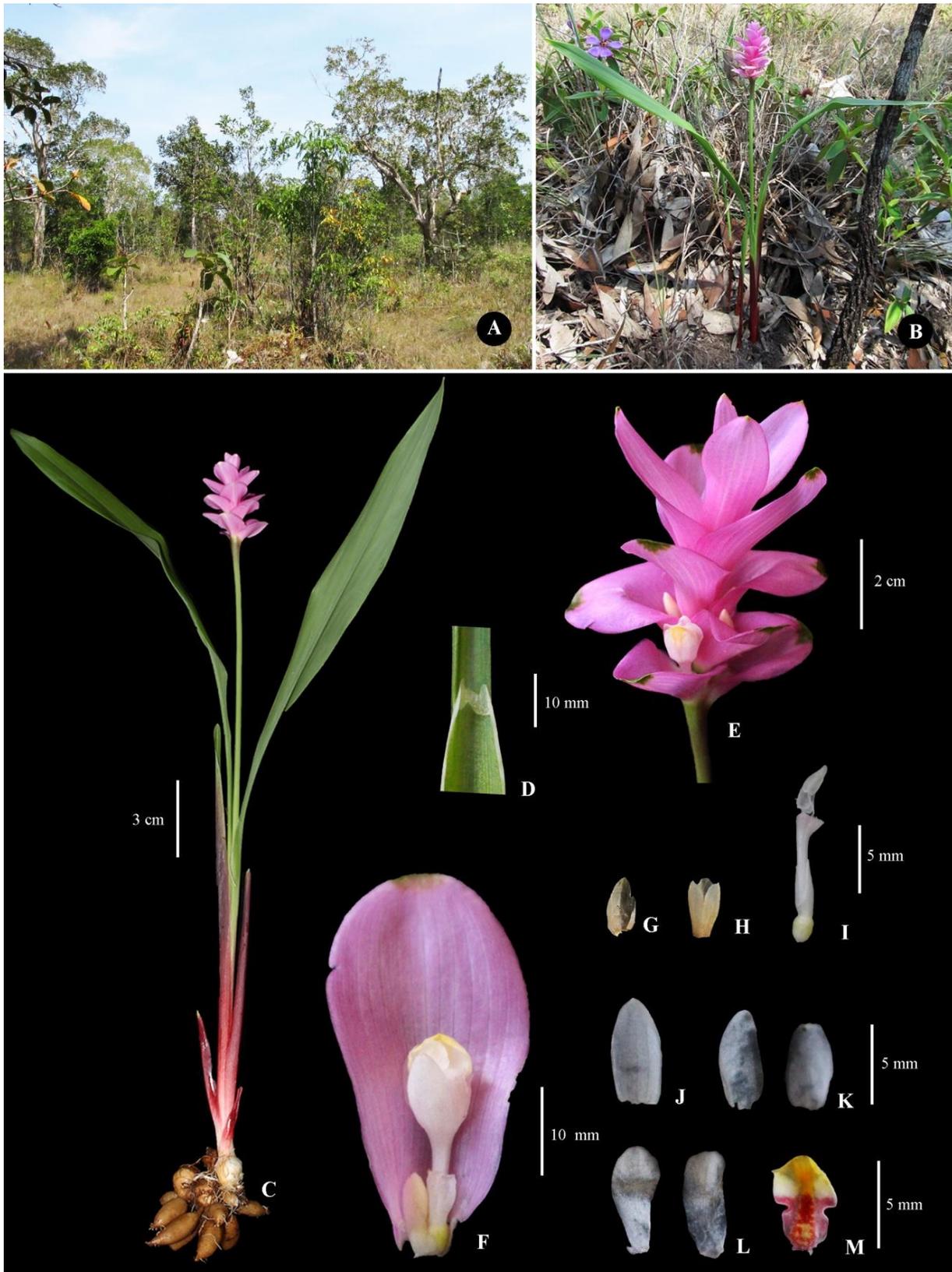


Figure 1. *Curcuma sparganiiifolia* Gagnep. A - Habitat; B - Plant in habit; C - detail of plant; D - Detail of legule; E - Spike; F - Basal bract showing a *Cincinni* with a blooming flower; G - bracteole; H - Calyx; I - Floral tube with anther in side view; J - Dorsal lobe; K - Lateral lobes; L - Lateral staminodes; M - Labellum. G-H: alcohol materials. Scale bars: G-H, J-H, L-M: 5 mm, respectively.

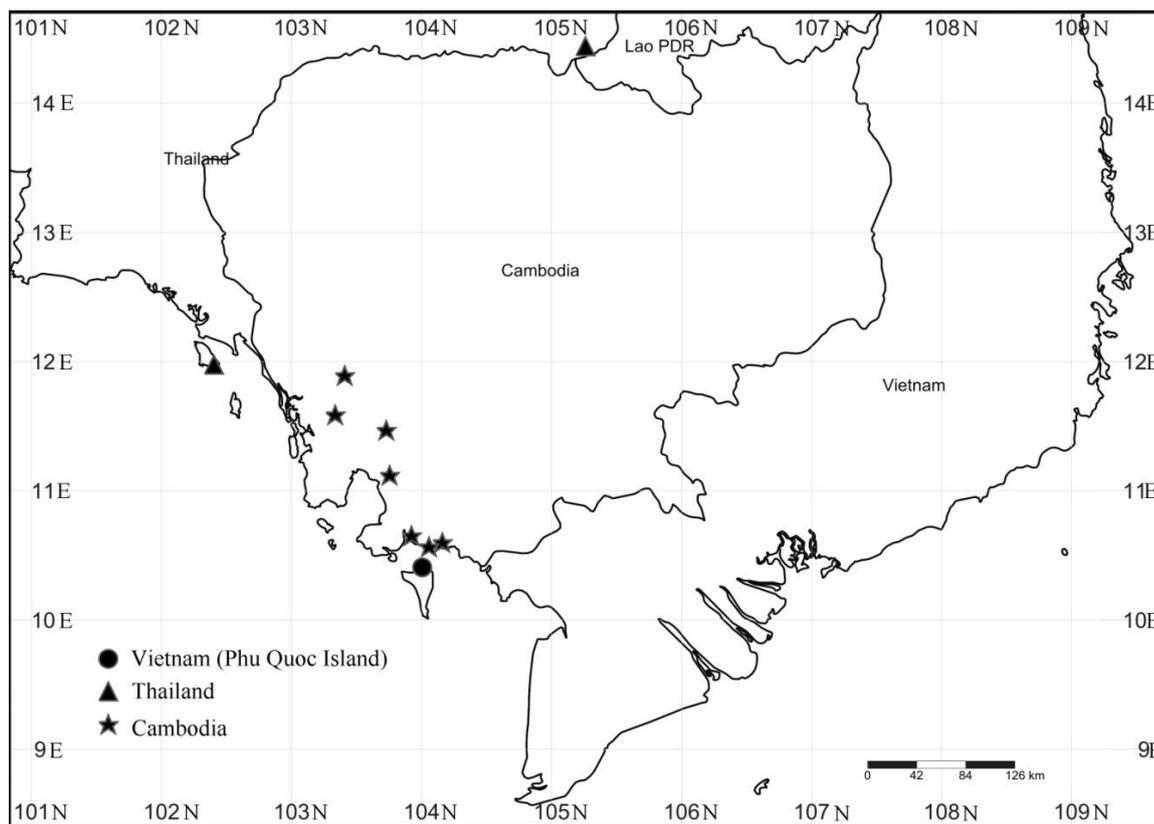


Figure 2. Distribution of *Curcuma sparganiifolia* in Cambodia, Thailand and



Figure 3. *Curcuma gracilima* Gagnep. in natural habitat at Tà Kóu Nature Reserve, Bình Thuận province. Photo by Lý Ngọc Sâm (2010).

tissue is sparsely glandular hairs, and the labellum is deeply bilobed and usually yellow with fine defined red streaks.

ACKNOWLEDGEMENTS

The authors thank the National Institute of Medicinal Materials for support under and the grant of the project *TNB.ĐT/14-19/C16* belonging to the Program of Tây Nam Bộ enabling our expedition in Phú Quốc District of Kiên Giang province where the newly recorded species was collected. We are grateful to Prof. Dr. Leonid Averyanov (LE) for providing the image of Pierre specimen housed at LE.

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