Phytotaxa 388 (4): 295–300
https://www.mapress.com/j/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.388.4.5

Zingiber vuquangense (Sect. *Cryptanthium:* Zingiberaceae): a new species from North central coast region, Vietnam

THỊ-HƯƠNG LÊ[1], THỊ-HƯƠNG TRỊNH[2,3], NGỌC-ĐÀI ĐỖ[4], VIỆT-HÙNG NGUYỄN[5] & NGỌC-SÂM LÝ[2,6*]

[1]*Faculty of Biology, Vinh University, 182, Lê Duẩn, Vinh, City, Nghệ An Province, Vietnam.*
[2] *Graduate University of Science and Technology, Vietnam Academy of Science and Technology (VAST), 18 Hoang Quốc Việt, Cầu Giấy Disstrict, Hà Nội.*
[3]*Faculty of Sciences, Hong Duc University, 565 Quang Trung road, Dong Ve, Thanh Hoa City*
[4]*Faculty of Agriculture, Forestry and Fishery, Nghe An College of Economics, 51 Lý Tự Trọng, Vinh City, Nghệ An Province.*
[5]*Vũ Quang National Park, Vũ Quang Town, Vũ Quang District, Hà Tĩnh Province.*
[6]*Department of Biological Resources, Institute of Tropical Biology, VAST, 85 Trần Quốc Toản Road, District 3, Hồ Chí Minh City (*Corresponding author's e-mail: lysamitb@gmail.com)*

Abstract

Zingiber vuquangense, a new species of Zingiberaceae, is described and illustrated from North Central Coast region of Vietnam. It is most similar to *Z. cornubracteatum,* but differs by its smaller plant, longer ligules and petiole, leaf shape, colour of bract, bracteole and flower, and fruit shape. Data on distribution, habitat, vernacular name and uses, a distribution map and a colour plate of the new species are presented.

Keywords: New species, Section *Cryptanthium*, Vietnam, *Zingiber*

Introduction

Zingiber Miller (1754: 525) is one of the largest genera in the family Zingiberaceae (Zingiberoideae), comprising approximately 180 species (ZRC 2017). It is widely distributed in tropical to warm-temperate to monsoonal tropical Asia with its centre of diversity in Southeast Asia (Theilade 1998, Škorničková & Newman 2015, Bai *et al.* 2015). *Zingiber* is distinguished from other genera of Zingiberaceae by its single anther with beak shaped appendage wrapping around the style. The general introduction to the genus, with particular focus on Vietnam, was given in recent publications by Leong-Škorničková *et al*. (2015), Lý (2016) and is therefore not repeated here. So far, thirty-three species of *Zingiber* are reported in Vietnam (Gagnepain 1908, Phạm 2000, Leong-Škorničková *et al*. 2015, Lý 2016, Lý *et al*. 2016, 2017), but the actual number is expected to be higher in the near future.

During extensive floristic explorations in the Nghệ An, Hà Tĩnh and Quảng Bình provinces of north central coastal region, Vietnam, during 2014–2017, several collections of an interesting *Zingiber* were collected by the second and third authors in Pù Hoạt Nature Reserve, Vũ Quang and Phong Nha–Kẻ Bàng National Parks, respectively. The collections have procumbent inflorescences somewhat embedded in ground, which belongs to *Zingiber* sect. *Cryptanthium* Horaninow (1862: 27). Critical examination of the flowering and fruiting materials, and comparison of type materials and protologues of closely related species from Vietnam and neighbouring countries (e.g. Gagnepain 1908, Theilade 1998, 1999, Phạm 2000, Wu & Larsen 2000, Triboun *et al.* 2014, Leong-Škorničková *et al*. 2015, Lý 2016), revealed that it did not match any hitherto described species. It is hence described here as a new species.

Material and Method

All measurements and description were made from mature individuals of living plants in the field, supplemented with alcohol preserved and herbarium specimens. Type specimens of the morphologically most closely related species were examined and/or accessed as hi-resolution digital images from AAU, BK, E, HN, P, SING, VNM, and VNMN

Accepted by Sin Yeng Wong: 7 Jan. 2019; published: 23 Jan. 2019

(herbarium codes follow Thiers (2018-continuously updated)). All morphological characters were described using the general terminology by Beentje (2016). The recognition of labellum and lateral staminodes as separate structures and the methodology of the measurements were followed the recent work of Bai *et al.* (2015). Conservation status was assessed using the IUCN Red list Categories and Criteria version 3.1 (IUCN 2018).

FIGURE 1. *Zingiber vuquangense*. A. Plant habit; B. Detail of plant; C. Detail of ligules; D. Basal part of shoots showing the inflorescence after anthesis and cross section of the rhizome; E. Rhizomes with one inflorescence and flowers; F. Flower (front view); G. Flower (side view); H. Infructescence; I. Fruit (in alcohol) and its opening; J1-J10. Basal bract (1), upper bracts (abaxially and adaxially) (2), Bracteoles (abaxially and adaxially) (3), Calyxes (4), Dorsal corolla lobe (5), lateral lobes (6), labellum and lateral staminodes (7), floral tube with stamen attached at apex (8), anther (9), ovary with epigynous glands and style and stigma (10); K. Seeds and arils. Figs. A-B, D-H, J photographed by Ngọc-Đài Đỗ and C, I, K by Ngọc-Sâm Lý.

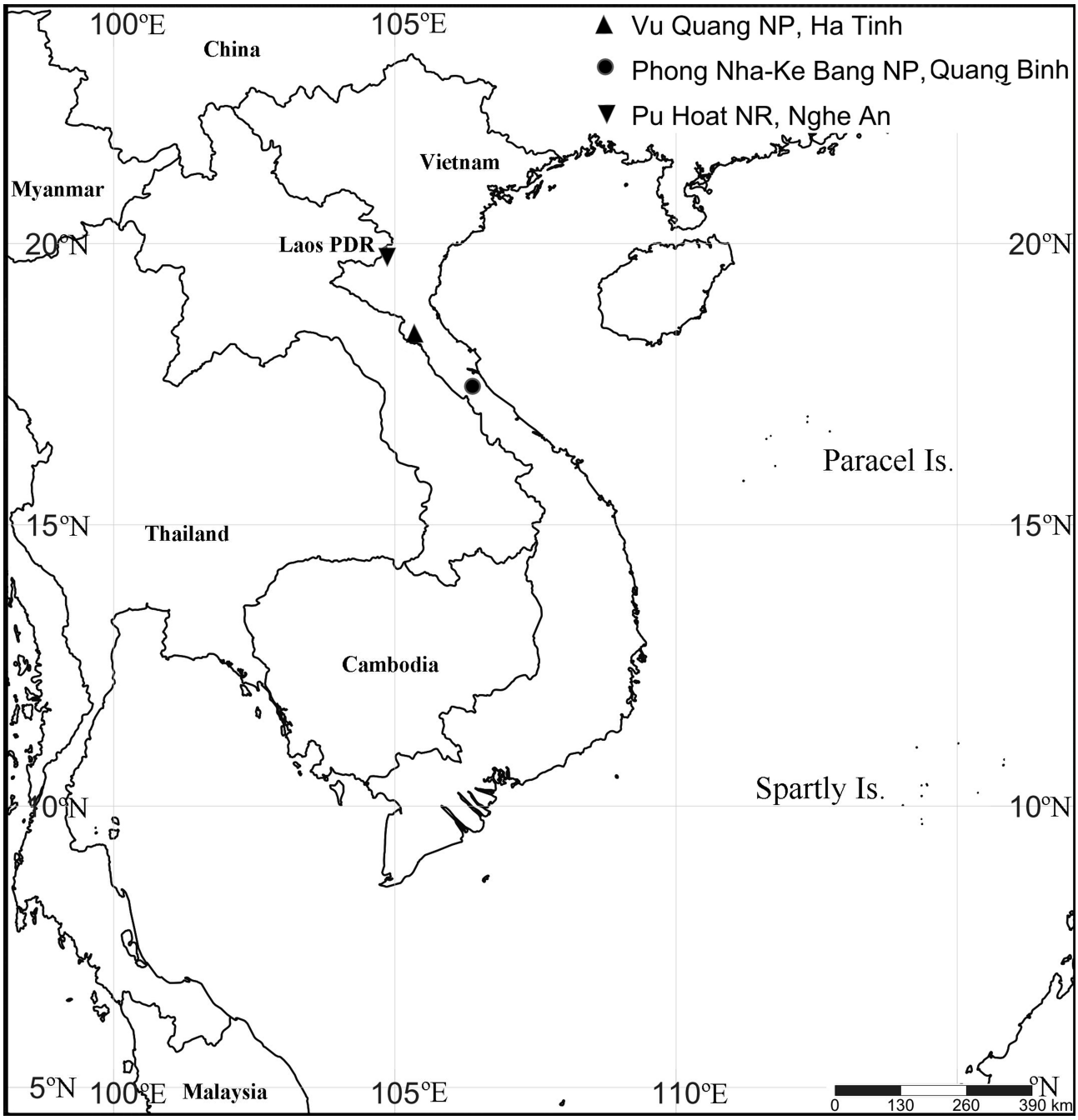

FIGURE. 2. Distribution of *Zingiber vuquangense* in Vietnam.

Taxonomic treatment

Zingiber vuquangense N.S. Lý, T.H. Lê, T.H. Trịnh, V.H. Nguyễn & N.Đ. Đỗ, ***sp. nov.*** (Figs. 1 & 2)

Zimgiber vuquangense is most similar morphologically to *Z. cornubracteatum,* but differs from the latter by smaller plant, longer ligules with lobes soon scarious when old, ragged and red-brown, longer petiole, lamina broadly elliptic to elliptic–ovate and glabrous, except densely pubescent along the below midrib, bract and bracteole pale yellow at base, brown-red distally, bright yellow corolla lobes, labellum pink-purple with pale yellow spots, yellow lateral staminodes with apex pink-purple and fruit ovoid.

Type:—VIETNAM. Hà Tĩnh Province: Vũ Quang National Park, Phan wall, 18°17′20″N, 105°21′41″E, 106 m elev., 26 April 2015, *Đỗ Ngọc Đài ĐNĐ-568* (holotype VNM; isotypes P & HN).

Perennial, non-stoloniferous, clump forming, rhizomatous herbs, 1.2–1.8 m tall. *Rhizome* fleshy, densely branched, (1.2–)1.5–2 cm in diam., dull brown externally, tinted pinkish-white internally, none aromatic, covered with brown triangular scales; root tubers absent; *scale* 2–3 cm long, light brown externally, paler internally, glabrous, soon decaying. *Leafy shoots* 4–8 per plant, forming dense clumps, somewhat spreading or arching, each shoot consisting of 9–21 well-developed leaves at flowering, aggregated on upper 2/3 to ¾ of pseudostem; bladeless sheaths 3–4, 2–34 cm long, green with red tinge; *leafy sheaths* reddish to tinted red-green near the base, dark green distally, inconspicuously longitudinally striate, sparsely hairy when young, becomes glabrous with age, margin densely brown ciliate (brown hairs); *ligules* deeply bilobed to basal half, 1.2–3 cm long, green, conspicuously longitudinally striate, somewhat hairy, lobes 1–2 cm long, coriaceous, margin hairy, apex obtuse, soon scarious when old, ragged and rusty brown, persistent; *petiole* stiff, canaliculated, 2.5–4 cm long, less than 1.5 cm long on most basal and distal leaves, green, densely brown pubescent at pulvinus, pubescent distally; *lamina* broadly elliptic to elliptic–ovate, 26–50.8 × 9–14.7 cm, adaxially dark green, abaxially light green, glabrous except densely pubescent along below midrib, very strongly plicate, base rounded to obtuse, rarely cuneate, apex short acuminate to attenuate, secondary veins prominent above, sunken below, margin scattered hairs near the base. *Inflorescences* 1–2 per plant, radical, arising from the base of pseudostem, 7–15 cm long, usually with 2 flowers opening at a time; *peduncle* usually fully embedded in ground, 2.5–11 × 1.1–1.5 cm, shortly pubescent, covered by 8–9 scales; basal scales triangular-ovate, 0.9–1.5 × 1.5–3 cm, upper scales oblong to obovate-oblong, 2–3.2 × 2.1–3.7 cm, base pale yellow, brown-red distally, apex retuse with short mucronate (mucro ca. 0.5 mm long), sparsely hairy at base, pubescent towards apex; *spike* ovoid-obovoid, 3.5—10 × 2.9–6.5 cm, composed of 26–30 loosely arranged bracts, each subtending a single flower, lower 2–3 sterile bracts; basal sterile bracts oblong, base slightly tapering, 2.3–2.8 × 3.1–3.9 cm, upper ones club-shaped [clavate] and attenuate, 2.8–3.2 × 1.2–2.7 cm, base pale yellow, brown-red distally, apex reflexed, exserted and incurved, tip rounded and mucronate with a mucro ca. 1 mm, margin ciliate, densely pubescent towards apex. *Bracteoles* oblong, 3.5–4.3 × 1.1–1.3 cm, brown-red at upper 1/3, pale yellow towards base, sparse hairs at base, densely pubescent distally, apex rounded, margin slightly serrate, ciliate. *Flowers* exserted from bracts, 7.8–8.4 cm long; *calyx* tubular, 16.5–17.5 mm long, clasping at base, translucent white, externally sparsely pubescent, with unilateral incision 7.5–8.5 mm long, apex with 2 acute tooth; *floral tube* 37–39 mm long, widening gradually towards apex, 7–8 mm wide at apex, cream at base, pale yellow towards apex, externally pubescent, internally pubescent at apex; *dorsal corolla lobe* triangular-ovate, 43–45 × 9–10 mm, pale yellow with semi-translucent veins, glabrous, apex acute, concave, slightly hooded; *lateral corolla lobes* narrowly triangular-ovate, 36–37 × 6–7.5 mm, pale yellow with semi-translucent veins, glabrous, apex acute, weakly concave at apex, deflexed at anthesis; *labellum* obovate, 38–41 mm long, 18–20 mm at widest point near the apex of labellum (25–30 mm broad, inclusive of lateral staminodes), pale yellow at base, pink-purple with small pale yellow spots, margin deflexed, slightly emarginate and undulate, glabrous, apex acute; *lateral staminodes* obovate to oblong, 20–22 × 8–11 mm, pale yellow with small pink-purple blotches at apex, semi-translucent veins, connate to labellum by apical 3/4, glabrous, apex rounded/obtuse. *Stamen* 30–32 mm long (unmanipulated); *filament* 2.5–3 mm long by ca. 3 mm wide, pale yellow, with very scattered short hairs; *anther* 15–17 mm long (crest not straightened), 3.5–4 mm broad, connective tissue pale yellow, glabrous; *anther crest* 15–17 mm (straightened), wrapped around stigma, light yellow with purple tinge towards apex, glabrous, tip bifid; *anther thecae* 14–15 mm long, dehiscing along the entire length. *Epigynous glands* two, subulate, 7–7.5 mm long, c. 1 mm in diam. at base, cream, apex acute. *Ovary* cylindrical, 7–7.5 × 3–3.5 mm, yellow-cream with white pubescence, trilocular with axile placentation; *style* 5.9–6.2 cm long, white, glabrous; *stigma* ca. 2 mm long, rounded, slightly thicker than style, white, ostiole front facing, ciliate. Infructescence ca. 11 cm long; peduncle ca. 5 × 1.5 cm, bract scales persistent, apical part composed of ca. 12 fruits; mature capsules sessile or pedicel 2 mm long, somewhat trigonous ovoid, 3.2–4 × 1.2–1.9 cm, light purple, sparsely pubescent, with accrescent bracteole 4–4.7 cm, apex with persistent floral tube 1.7–1.8 cm long, (6–)16–20 seeds per fruit; seeds 4–11 per locule, irregular obovoid, 4–5 × 3.5–4 cm, pink-red, surface irregular furrow, with sparsely echinate at apex; arils translucent white, ciliate.

Phenology:—Flowering and fruiting: April–June.

***Etymology*:**—The specific epithet refers to the Vũ Quang NP where the new species was firstly discovered and collected.

Distribution and habitat:—The new species is found from five localities in the provinces of Quảng Bình, Hà Tĩnh, Nghệ An, Ninh Bình and Phú Phọ in Vietnam. It grows along stream side, wet ground or hill slopes in secondary broad-leaved forest in Vũ Quang NP and Pù Hoạt NR at the altitude 70–600 m elev., and grows in lower primary evergreen broad-leaved tropical forest in Phong Nha-Kẻ Bàng NP at an altitude of 776–872 m elev. The three localities are distanced about 150 km from each other. It also found in Cúc Phương and Xuân Sơn NPs (Fig. 2).

Conservation status:—Currently only a population which together consists of about 20 mature clumps in a total

Area of Occupancy (AOO) of less than 550 km^2 on Vũ Quang NP, a population of about 10 mature clumps in a total AOO of less than 357 km^2 on Pù Hoạt NR, and a population of about 40 mature clumps in a total AOO of about 857 km^2 on Phong Nha-Kẻ Bàng NP were observed. There is no threat to these populations in those localities. The new species also occurred on Cúc Phương NP, Ninh Bình Province (AOO: 222 km^2) and Xuân Sơn NP, Phú Thọ Provnice (AOO: 150.5 km^2) based on the materials at the herbarium of the Vietnam Academy of Science and Technology (HN), but the number and size of the populations are not yet exactly known. It is expected that this species will be reported from other localities in near future. Based on currently available data we therefore provisionally assess this species as Data Deficent (DD) according to the IUCN Red list criteria (IUCN, 2012). Further exploration of the region is required.

Vernacular name and use:—In the Thái langue (Cắm Muộn Commune, Quế Phong District, Nghệ An Province), the vernacular name of this species is locally called Có hủm and its grilled rhizomes are tied on throat to cure cough and cold.

Additional specimens examined (Paratype):—VIETNAM. Hà Tĩnh Province: Vũ Quang NP, Phan wall, 18°17′20″N, 105°21′41″E, 106 m elev., 17 July 2014, Lê Thị Hương, *Hương-134, 141*(VNM), *Hương-570* (HN); ibidem, 01 May 2016, *Lê Thị Hương, Nguyễn Việt Hùng, Trịnh Thị Hương*, *HHH-387, 393* (HN). Quảng Bình Province: Quảng Ninh District, Tân Trạch Commune, Phong Nha–Kẻ Bàng NP, U Bò hill, 17°27′44″N, 106°22′51″E, 632 m elev., 16 August 2014, *Đỗ Ngọc Đài, Đài-572* (HN, VNMN); ibidem, 17°28′47″N, 106°19′50″E, 735 m elev., 06 June 2017, *Đỗ Ngọc Đài, Đài- 875, 883, 891*(HN, VNMN). Nghệ An Province: Quế Phong District, Cắm Muộn Commune, Pù Hoạt Natural Reserve, 19°49′25″N, 104°54′080″E, 610 m elev., 02 November 2017, *Lê Thị Hương*, *Hương-263* (HN). Phú Thọ Province: Xuân Sơn NP, 31 October 2001, Phương 4770 (HN!). Ninh Bình Province: Bống village, Cúc Phương NP, 16 October 1996, Nguyễn Quốc Bình, Nguyễn mạnh Cương 35 (2 sheets, HN!).

TABLE 1. Comparison between *Zingiber vuquangense* and Z. *cornubracteatum*

Characters	Z. *vuquangense*	Z. *cornubracteatum*
Plant height	1.2–1.8 m	1.8–2.6 m
Ligule	lobes 1–2 cm long, soon scarious when old, ragged and rusty brown	lobes ca. 0.4 cm long, slightly truncate, non scarious when old, entire and green
Petiole	2.5–4 cm long	2–2.5 cm long
Lamina	broadly elliptic to elliptic–ovate, glabrous except densely pubescent along below midrib	ovate to lanceolate, abaxially sparsely hairy adaxially
Spike	ovoid-obovoid	fusiform or obconical
Bracts	2.3–2.8 × 3.1–3.9 cm, brown-red apex with mucronate tip	5–10 × ca. 2.8 cm, orange red apex with hook–like tip
Bracteole	base pale yellow, brown-red distally	base cream, red in upper part
Calyx	1.7–1.8 cm long, apex with 2 shortly acute tooth	2.2–2.5 cm long, apex with two lobes 1.1–1.2 cm long
Corolla tube	3.7–3.9 cm long	ca. 5 cm long
Corolla lobes	bright yellow, dorsal lobes 4.3–4.5 × 0.9–1 cm	red, dorsal lobe 3.3–3.5 × 1.1–1.2 cm
Labellum	38–41 × 18–20 mm, pink-purple with pale yellow spots, apex acute	ca. 25 × 18 mm, red with or without cream mottling, apex bilobed
Lateral staminodes	yellow with apex pink-purple	red
Fruit	ovoid, 3.2–4 × 1.2–1.9 cm	obovoid to obloid, ca. 2.8 × 2.3–2.4 cm

Notes:—*Zingiber vuquangense* is most similar morphologically to Z. *cornubracteatum* Triboun & Larsen (2014: 60), which is distributed in hill evergreen forest (800–1,100 m elev.) in Mae Hong Son, Northern Thailand (Triboun *et al*., 2014), in the general habit, bract shape and lateral staminodes. However, the new species differs from Z. *cornubracteatum* by its smaller plant, longer ligules and petiole, leaf shape, colour of bract, bracteole and flower, and fruit shape (see Table 1).

Zingiber vuquangense was first discovered from Cúc Phương NP, Ninh Bình Province, in 1996 by Nguyễn Quốc Bình and Nguyễn Mạnh Cương (HN). Subsequently this taxon was collected from Xuân Sơn NP, Phú Thọ Province, northern Vietnam in 2001 by Vũ Xuân Phương (HN). The plants exhibit the same characters of ligules, leaves and flowers but have long peduncles of inflorescences compared to those from Pù Hoạt NR, Vũ Quang and Phong Nha NPs. Moreover, the plants grow in Pù Hoạt NR and Phong Nha-Kẻ Bàng NP exhibiting small habit and small leaves compared to those from Vũ Quang NP and the remaining localities, respectively.

Acknowledgements

We thank the managers and numerous staff of Pù Hoạt NR, Phong Nha – Kẻ Bàng NP, Vũ Quang NP for their supporting in processing the permits and field assistances. We thank the Curator of HN herbarium and they staff for letting us examined herbarium specimens. We are very grateful to Prof. Dr. Mamiyil Sabu (University of Calicut, Kerala, India) for his constructive comments and language improvements to this manuscript, to the anonymous reviewer for sharing with us images of herbarium specimens of this new species at HN as well as other constructive comments of this manuscript. The work of the first author was supported by project grant no. 106-NN.03–2017.328 funded by the National Foundation for Science and Technology (NAFOSTED).

References

Bai, L., Leong-Škorničková, J. & Xia, N.H. (2015) Taxonomic studies on *Zingiber* (Zingiberaceae) in China I: *Z. kerrii* and the synonymy of *Zingiber menghaiense* and *Z. stipitatum*. *Gardens' Bulletin Singapore* 59: 129–142. https://doi.org/10.3850/S2382581215000149

Beentje, H. (2012) *The Kew Plant Glossary, an illustrated dictionary of plant terms (2nd edition)*. Royal Botanic Gardens, Kew.

Bentham, G. & Hooker, J.D. (1883) *Genera Plantarum 3 (2)*. L. Reeve & Co. & Williams & Norgate, London, 811 pp.

Gagnepain, F. (1908) Zingibéracées. *In:* Lecomte, H. (Ed.) *Flore générale de l'Indo-Chine, vol. 6.* Masson & Co., Paris, pp. 25–121.

Horaninow, P. (1862) *Prodromus monographiae Scitaminearum*. Academia Cesareae Scientiarum, St. Petersburg, 45 pp.

Leong-Škorničková, J. & Newman, M. (2015) *Gingers of Cambodia, Laos and Vietnam*. Oxford Graphic Printer Pte Ltd, Singapore, 229 pp.

Leong-Škorničková, J., Nguyễn, Q.B., Trần, H.Đ., Šída, O., Rybková, R. & Trương, B.V. (2015) Nine new *Zingiber* species (Zingiberaceae) from Vietnam. *Phytotaxa* 219: 201–220. http://dx.doi.org/10.11646/phytotaxa.219.3.1

Lý, N.S. (2016) *Zingiber skornickovae*, a new species of Zingiberaceae from Central Vietnam. *Phytotaxa* 265: 139–144. https://doi.org/10.11646/phytotaxa.265.2.5

Lý, N.S., Trương, B.D. & Lê, T.H. (2016) *Zingiber ottensii* Valeton (Zingiberaceae) – a newly recorded species for Vietnam. *Bioscience Discovery* 7: 93–96.

Lý, N.S., Đặng, V.S., Đỗ, Đ.G., Trần, T.T., Đỗ, N.Đ. & Nguyễn, D.H. (2017) *Zingiber nudicarpum* D. Fang (Zingiberaceae), a newly recorded species for Vietnam. *Bioscience Discovery* 8: 1–5.

Miller, P. (1754) *The Gardeners Dictionary, ed. 4*. Rivington, London, 525 pp.

Phạm, H.H. (2000) *Cây cỏ Việt Nam, an illustrated Flora of Vietnam 3*. Young Publishing House, Ho Chi Minh City, pp. 432–461. [In Vietnamese with English summary]

Theilade, I. (1998) Revision of the genus *Zingiber* in Peninsular Malaysia. *Gardens' Bulletin Singapore* 48: 207–236.

Theilade, I. (1999) A synopsis of the genus *Zingiber* (Zingiberaceae) in Thailand. *Nordic Journal of Botany* 19: 389–410. https://doi.org/10.1111/j.1756-1051.1999.tb01220.x

Thiers, B. (2018) (continuously updated) Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih/ (accessed 20 March 2018)

Triboun, P., Larsen, K. & Chantaranothai, P. (2014) A key to the genus *Zingiber* (Zingiberaceae) in Thailand with description of 10 new taxa. *Thai Journal of Botany* 6: 53–77.

Wu, T.L. & Larsen, K. (2000) Zingiberaceae. *In:* Wu, Z.Y. & Raven, P.H. (Eds.) *Flora of China 24*. Science Press, Beijing, pp. 333–346.

ZRC [Zingiberaceae Resource Centre] (2017) *Zingiber*. Royal Botanic Garden Edinburgh. Available from: http://padme.rbge.org.uk/ZRC/ (accessed 15 December 2017)