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RESEARCH ARTICLE

The genus *Aspidistra* Ker-Gawl. (Asparagaceae) in Vietnam

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ABSTRACT: A historical outline of the knowledge of *Aspidistra* in Vietnam highlights the enormous increase of well-known species number during the past decade. An extended and comprehensive determination key for the currently known 43 Vietnamese *Aspidistra* species is designed to summarize the actual state of knowledge, to facilitate determination, to stimulate further field exploration and biological studies of this extraordinarily diverse genus.

KEY WORDS: *Aspidistra*, Asparagaceae, pollination, Flora of Vietnam.

INTRODUCTION

The genus *Aspidistra* is found in SE Asia from warm-temperate to subtropical and tropical monsoon forests ranging from lowlands up to 1500 m a.s.l. The species richness of this genus of evergreen understorey plants was overlooked for a long time, since most species set their flowers at ground level, often more or less hidden in litter material. Beginning in 1822, when Ker-Gawler described *A. lurida* from a cultivated plant, the species number increased very slowly to 11 in 1980. Since then the species number began to grow rapidly, especially in China, with the diversity center in the Guangxi Province. Only a few species are known from Thailand, Laos, Malaysia, Japan, and NE India (Assam). The state of knowledge at the end of the 20th century was summarised by Liang and Tamura (2000) and Li (2004). The knowledge of *Aspidistra* in Vietnam for a long time stayed behind the general progress. At the end of the 20th century only 3 species were known: Baillon (1894) had described *A. typica* from a plant in cultivation in Paris and could only assume "Tonkin" as its origin. Gagnepain (1934 a, b) introduced two monotypic genera from Vietnam, *Evrardiella dodecandra* and *Colania tonkinensis*. Both are now identified as members of *Aspidistra*.

It is thanks to Nokolaj N. Arnautov(†), for many years gardener and enthusiastic botanist at the Komarov Botanical Institute St. Petersburg, that living *Aspidistra* plants came into cultivation in greenhouses. He collected a number of plants during field excursions across Vietnam between 1978 and 1991. Unfortunately, he was not aware that these plants represented undescribed species, and he named them erroneously after species known at that time from China (Arnautov, 2002). Cuttings of these plants came to the Botanical Garden Munich in 1996 and served as a starting stock for the now rich *Aspidistra* collection there. During an extended field trip in 1997, Josef Bogner, Gardener and Scientist at the Botanical Garden Munich, collected a great number of *Aspidistra* plants. After most of them set flowers during the following years, a number of species new to science could be identified (Tillich, 2005). The most effective collector in the past decade was Leonid V. Averyanov, Komarov Botanical Institute of the Russian Academy of Sciences, St. Petersburg. His tireless diligence contributed essentially to the rapid increase of well-known Vietnamese species.

Herbarium studies (HN, LE, M, MSB, MO) have lead to the identification of additional new species and helped to complete the knowledge of species distribution. However, most species seem to be stenoendemic, they are known from the type location only. The literature of the past decade signalizes an increasing interest in *Aspidistra* in Vietnam (Bogner and Arnautov, 2004; Bräuchler and Ngoc, 2005; Tillich, 2006, 2008; Tillich et al., 2007; Tillich and Averyanov, 2008, 2012; Phonsena and de Wilde, 2010; Averyanov and Tillich, 2012, 2013a, b; Tillich and Leong-Škorničkova, 2013; Wislobokov et al., 2013).

Also the informations on the pollination biology now reach a new quality. Kato (1995) and Conran & Bradbury (2007) had found pollen feeding amphipods as most probable pollinators in cultivated *A. elatior* stands. The question was left open whether small litter destroying arthropods visit the space below the stigma just as feeding site and eventually as breeding chamber, without or with only accidental pollination. The study of Wislobokov et al. (2013) in the natural habitat of *A. phanluongii* now gives well-founded arguments for small flies (Phoridae) to be effective pollinators. However, the enormous diversity in flower structure leaves open a wide field of research (Fig. 1).

Numerous field excursions and research activities of foreign researchers have been organized, guided

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and/or supported in various ways during the past decades by the Directorate of the Center for Plant Conservation (Vietnam Union of Science and Technology Associations), first of all Prof. Phan Ke Loc and Dr. Nguyen Tien Hiep. Thanks to all these efforts the number of *Aspidistra* species in Vietnam has raised from 3 to 43 in one decade. The Vietnamese *Aspidistra* flora now covers more than one third of the total of 117 currently known species. The unexpected diversity in flower structure makes this genus one of the most interesting among monocots, and this forces further field research. Much more members of this fascinating genus can be expected in the next future. It became evident during last years that nearly every expedition into earlier unstudied regions brings out new discoveries. The area of the genus reaches in Vietnam southward to Đồng Nai Province at about 11° northern latitude. However, the center of diversification and formation of numerous endemic species obviously is the limestone area in northern Vietnam and adjacent China, Guangxi Province. The present paper intends to draw further attention onto this spectacular genus and to stimulate future field investigations in Vietnam.

The following key gives a complete survey of our current knowledge of 43 species of *Aspidistra* in Vietnam. It includes an extended description of all species to support determination. The type specimen and, if existing, further herbarium specimens are mentioned. Specimens which were harvested in consecutive years from the type plant in cultivation or from the type population are handled as paratypes.

Key to Vietnamese species of *Aspidistra* Ker-Gawl.

1a. Shoot growing vertically, supported by stilt roots …….. 2
1b. Shoot (rhizome) growing adjacent to substrat, or hypogeous …... 5
2a. Perigone obconic, balloon-like, 3–4.5 cm in diam., beige, hanging at an descending peduncle of 6–11 cm, perigone opening is a pore of 1.5–2 mm facing the ground. Pistil obconical to mushroom like. Stamens 12–14, anthers lineate, sessile at perigone base. “Tonkin”: *LX-VN 3010* (HN). Type: Quảng Nam Prov., Phước Sơn. Distr. *Arnautov 86-112* (holo LE, paratypes: *Bogner 2815a, 2815d* (M), *Bogner 2815b* (B), *Bogner 2815c* (HNU). Fig. 1 C, D ……..……..…….. **1. *A. locii*** Arnautov & Bogner
2b. Perigone with wide opening and well developed perigone lobes …. ….……...…….. 3
3a. Perigone widely campanulate, 60–70(–90) mm across, blackish violet, lobes 8–10, rounded or mucronate, 8–10 mm long, 9–12 mm wide. Pistil obconical, 13–15 mm tall, stigma circular, flat, violet, with 4–5 radial whitish bi- or trifurcate lines. Stamens 8–10, close to base of tube. Stem semi-woody, up to 120 cm tall. Thừa Thiên-Huế Prov., very common in several places in Nam Đông Distr. Type: *Averyanov et al. Hal 11041* (holo HN, iso LE). Fig. 1 M …..……. ……..... **2. *A. nikolaii*** Averyanov & Tillich
3b. Perigone funnel-shaped or urceolate, not exceeding 30 mm in diam .....……..... 4
4a. Perigone widely funnel-shaped, 25–30 mm across, tube green outside, pale yellow inside, lobes 6 or 8, purple, deltoid to widely ovoid, in two circles, smooth. Stamens 6 or 8, at upper end of tube, their tips visible from above in the narrow slit between stigma margin and tube wall. Pistil mushroom-shaped, cream-white, stigma 12 mm across. Peduncle 0.5–1.5 cm. Leaf blade lanceolate, stiff upright, 20–25 × 6–7 cm. Thừa Thiên-Huế Prov., Bạch Mã NP. Type: *Tillich 4361* (holo M, para *Tillich 4983* MO) ……..…. ……... **3. A. *lateralis*** Tillich
4b. Perigone urceolate, 14–18 mm long and wide, pale green to yellow outside, speckled with purple-brown markings, dark purple-violet to almost black inside, lobes 6, deltoid with blunt tips, erect or slightly outcurved, smooth. Stamens 6, inserted at middle of perigone. Pistil table-shaped, style cylindrical, 7–8 mm tall, stigma discoid, 3.5–5 mm in diam. Peduncle horizontally, 15–25 mm long. Hòa Bình Prov, Lạc Sơn Distr …….. **4. *A. lubae*** Averyanov & Tillich
01a. Petiole stiff, erect or inclined, 5–10 cm long. Leaf blade arching to almost horizontal, elliptic to narrowly elliptic, (12)14–18(20) × (2)2.5–4.5(5) cm, with small yellowish spots, irregularly undulate at margin. Type: *L. Averyanov, T. Maisak, L. Osinovetz (No. 4) et al. CPC 1566a* (holo LE) …. **var. *lubae***
01b. Petiole stiff, erect, straight, 2–5 cm long. Leaf blade erect or distally arching, lanceolate, 20–25 × 1.5–3(4) cm, broadly irregularly undulate at margin, uniformly grass green. Type: *L. Averyanov, T. Maisak, L. Osinovetz (No. 1) et al. CPC 1566a* (holo LE). ……..…… **var. *lancifolia*** Averyanov & Tillich
5a. Leaves linear to narrow linear-lanceolate, appearing in tufts of (2–)3–5, petiole missing or indistinct ……..…. 6
5b. Leaves distinctly differentiated into petiole and blade ……..…. 9
6a. Perigone lobes 8, Flowers in groups, diam. 25 mm, 30 mm tall, lobes 7–8 mm long, 6–7 mm wide, upper surface glossy red, smooth except for the lower third that bears 4 low keels. Stigma flat, white, with 4 marginal incisions. Leaves oblanceolate, 80–90 × 9–10 cm. Hòa Bình Prov.: *Hiep et al. HAL 498* (HN), Thanh Hóa Prov.: *HAL 3591*, (HN, iso LE). Type: Ninh Bình Prov., Cúc Phương NP: *Tillich 4360* (holo M, para *Bogner 2500* M). Fig. 1 R ……..…. ……**5. A. *bogneri*** Tillich
6b. Perigone lobes 6, rarely 8 in individual flowers ……..…. 7
7a. Flower diam. 4–5 mm, perigone urceolate, pale green to bluish green, speckled with red. Leaves up to 65 cm × 1–2.5 cm. Lâm Đồng Prov. (in HN, MO, LE), Thái Nguyên Prov.: *Averyanov et al. VH 5031,* (HN, LE). Type: China: HonKong: *Ford 626*, (BM). (In China widely distributed in Guangxi, Guangdong, Hunan, and Hainan Provs.) ……..…. **6. *A. minutiflora*** Stapf
7b. Flower diam. at least 10 mm, perigone purple ..…… 8
8a. Perigone campanulate, length and diameter 20 mm each, purple outside, blackish purple inside, tube and lobes thick carneous, lobes stiff upright, triangular, 10 mm long and 8 mm wide, with two fleshy high keels, each fusing basally with an keel of the adjoining lobe, thus forming a shared structure similar a paracorolla. Stigma conoid, purple, 5 mm high, with irregular radial curly crests. Lâm Đồng Prov., Đa Lạt City. Type: holo *Tillich 4476* (M), para *Tillich 5483* (LE), *Tillich 4981* (MO), *Tillich 4965* (HN) …. **7. *A. carnosa*** Tillich
8b. Perigone cup-shaped to slightly urceolate, lobes bent outwards, with 3–4 keels running down to tube, stigma flat to slightly convex. “Tonkin”: *HPP 190*. (HN). Type: China: Hainan: *F.C.How 70382* (holo IBSC, iso PE, IBG) ……..... ……..**8. *A. hainanensis*** W.Y.Chun & F.C.How aggr. Note: a polymorphic complex distributed from SE China to peninsular Malaysia.
9a. Flowers uniformly white, peduncle erect ……..…. 10
9b. Flowers at least partially purple, deep violet, yellow, or greenish … ……..... 11
10a. Perigone tube widely funnel shaped, 6 mm long, flower diam. ca. 30 mm, lobes radiate, distally rounded, 12 × 7–8 mm. Peduncle 8–15 cm long. Leaf blade 18–30 × 8–15 cm. Cao Bằng Prov.: *Loc et al. CBL 1675* (HN, MO) Type: China: Guangxi Prov.: *Longzhou Expedition 2-489* (GXMI) ……..… ……..... **9. *A. dolichanthera*** X .X. Chen
10b. Perigone campanulate, diam. 10–15 mm, with very pleasant fragrance, lobes narrow triangular, 10 × 3 mm, distally bent outward. Leaf blade 9–15 × 3–5 cm. Thuyên Quang Prov., Nà

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Hang Distr. Type: *P. K. Loc et al. HAL 211* (holo HN, photo M) ……..…….. **10. *A. campanulata*** Tillich

11a. Perigone tube depressed urceolate, twice as wide as high, 30 mm in diam., lobes (11–)12, narrow lineate with wider base, ca. 50–60 mm long, white and densely purplish mottled, with a basal appendage protruding horizontally over the tube opening and thus reducing it to 15–18 mm. Stamens (11–)12, at periphery of tube base. Stigma disc-shaped, ca. 8 mm thick, centrally white with 5 purple radial ribs, the margin with 22–24 fine teeth. Leaf blade narrow obovate, ca. 50 × 11 cm. Hòa Bình Prov., Mai Châu Distr. Type: *Harder et al. DKH 8132* (holo LE, iso M) ..... ……..…….. **11. *A. grandiflora*** Tillich

11b. Flower not with this combination of characters …….. 12

12a. Perigone without lobes, ovoid, 12 mm long and 9–10 mm wide, its distal opening a small pore of 1.5–2 mm. Stamens 6, at basal third of perigone, sessile. Pistil mushroom-shaped, stigma hemispherical, 6 mm wide and high. Peduncle slender, decumbent. Petiole stiff, 25–35 cm, Leaf blade narrowly ovate, ca. 30 × 6 cm. Type: *1111 ep* (holo HN, photo M) Note: The plant was collected anywhere in North Vietnam. The type label (FLORA VIETNAMICA) gives no information concerning collection site nor collectors name…..... **12. *A. recondita*** Tillich

12b. Perigone with 6 or 8–10 lobes ……..…… 13

13a. Perigone with 6 lobes ……..… 14

13b. Perigone with 8–10 lobes ……..…. 40

14a. Stamens (10–)12, twice the number of perigone lobes, sessile at tube base; peduncle 10 cm long, erect, perigone lobes ovate-acuminate, sharply straight reflexed. Pistil obconical, clearly rising above perigone tube, stigma flat, circular, 2 cm in diam. Khán Hòa Prov., Nha Trang Distr. Type: *Evrard No 613* (P) *(Evrardiella dodecandra* Gagnepain) ……..…… ……..…….. **13. *A. dodecandra*** (Gagnepain) Tillich

14b. Stamens 6 or 8(–10), the same number as perigone lobes …..... 15

15a. Pistil cylindrical, club-shaped, or narrow obconical, style clearly longer than stigma diameter ……..……..…. 16

15b. Pistil often mushroom- or table-shaped, stigma distinctly wider than style diameter ……..……. 22

16a. Perigone whitish to pale yellow, tube narrow funnel-shaped to nearly tubular, 25–30 mm long, diam. ca. 6 mm, lobes ovate to ligulate, 7–8 × 3–4 mm, straight, obliquely divaricate, smooth. Stamens 6, at upper end of tube, anthers sessile, lineate, ca. 5 mm long, far overtopping pistil, connectives with elongated white apical appendages approaching each other and thus narrowing the flower entrance. Pistil very small, slender, cylindrical, ca. 5 mm long, stigma capitate, hardly wider than style. Ngệ An Prov., Tuong Duong Distr., not rare along the Khe Mat stream. Type: *HLF 6705* (holo HN, iso LE). Fig. 1Q ……..…….. ……. **14. *A. brachystyla*** Averyanov & Tillich

16b. Perigone at least partly purple or blackish blue, pistil not over-topped by stamens …….. 17

17a. Perigone tube outside pale yellow or slightly tinged with red, inside glossy red, narrow cylindrical, 6–7 mm in diam., embraced by 3 or 4 greenish, red spotted bracts, lobes yellow, rounded, patent, smooth, distinctly in two circles. Flower subsessile, horizontal, 16–17 mm long. Stamens at middle of tube, narrow lineate, distally reaching stigma level. Pistil 8 mm long, style cylindrical, stigma somewhat widened, nearly closing the tube opening, surface white with reddish margins. Petiole ca. 5 cm, Leaf blade ovate-attenuate, horizontal, relatively thick, 15 × 6–7 cm, densely fair green/dark green marmorate. Son La Prov., Thuân Châu Distr. Type: *Tillich 4481* (M) Fig. 1F….**15. *A. lutea*** Tillich (Note: In China, Guangxi Prov., there is a variety with long petiolate leaves (petiole up to 20 cm) and thin uniformly green leaf blades (*Chun-Rui Lin,* IBK)).

17b. Perigone tube blackish violet, purple, or white ……..……... 18

18a. Perigone blackish violet, campanulate or slightly urceolate, perigone lobes without keels ……..... 19

18b. Perigone not blackish violet, if campanulate, then lobes with 4 keels at lower third ……..…… 20

19a. Perigone dark violet to blackish blue, tube 10 mm long and 8 mm wide, campanulate, lobes narrowly triangular, 10 × 5 mm, stigma rounded triangular to trilobed, 4 mm in diam. Peduncle erect. Leaf blade lanceolate, 18–25 × 3–4.5 cm. Hòa Bình Prov.: *Hiep et al.* (HN), Type: Thừa Thiên-Huế Prov., Bạch Mã NP: *Tillich 4357* (holo M, para *Bogner 2309* M). Fig. 1 A ……..……... ……..……... **16. *A. atroviolacea*** Tillich

19b. Perigone dark purplish violet, tube 10 mm long and wide, slightly urceolate, (9 mm at throat), lobes triangular, 7 × 5 mm, stigma rounded hexagonal, with 6 shallow marginal incisions, 4–5 mm in diam. Peduncle decumbent. Leaf blade lineate-lanceolate, 18–33 × 1.2–2 cm. Đà Nẵng Prov., Hòa Vang Distr. Type: *Bräuchler 3000* (holo M, iso MSB) …….. **17. *A. renatae*** Bräuchler

20a. Perigone tube widely bowl-shaped, 14–16 mm in diam., 8–10 mm high, white, outside with some red spots, lobes triangular, slightly recurved, 6–10 mm long, adaxially black-purple at base, white at apex. Style cylindrical, 5–7 mm tall, stigma discoid, 4–5 mm in diam, white with purple margin, thus forming a striking contrast to the milk-white tube base. Peduncle 4–10 cm, decumbent, white or tinged with red. Leaf blade elliptic, shortly attenuate at base and apex, 12–16 × 3–4.5 cm. Cao Bang Prov., Trùng Khánh Distr. Type: *L. Averyanov, P.K.Loc, P.V.The, N.T.Vinh, HAL 5579* (holo MO, iso HN, LE) ….... **18. *A. albopurpurea*** Averyanov & Tillich

20b. Perigone tubular or campanulate 21

21a. Peduncle 4–8 cm, decumbent. Perigone tubular, tube 2.5 cm long, basally urceolately widened, diam. 8–9 mm in upper half, 12–15 mm at wider base; lobes 6, narrow lineate, 11–12 × 2 mm, adaxially with two keels running down to base of tube. Stamens 6, at base of tube, filaments 4 mm long, basally triangularly widened, in close contact to each other and to ovar and style. Pistil 10 mm long, stigma funnel-shaped (?), ca. 4 mm in diam. Cao Bằng Prov., north of Cao Bằng Town. Type: *Averyanov et al. CBL 981* (holo MO 04966239, iso HN) …….. **19 *A. tubiflora*** Tillich

21b. Peduncle 0.2–0.5 cm. Perigone campanulate, purple, 15 mm long, tube 10 mm long, diam. 7 mm, lobes 6, ligulate with rounded tips, 4–5 × 2 mm, with two low median keels and at basal margins with verrucose keels in contact to that of an adjacent lobe. Stamens sessile, linear, at lower third of tube, 4.5 × 1.5 mm. Pistil slender, 10 mm long, style distally gradually widened to stigma, stigma diam. 3 mm, surface smooth. Petiole stiff, (15–)30–35 cm, Leaf blade obovate-acuminate, 30 × 10(–11) cm. Type: *1159 ep* (holo HN, photo M). Note: The plant was collected anywhere in North Vietnam. The type label (FLORA VIETNAMICA) gives no information concerning collection site nor collectors name …… …… **20. *A. umbrosa*** Tillich

22a. (15) Perigone urceolate to globular, diam. 15–22 mm, outside green an red mottled, inside and along narrow cuneiform areas outside between the lobes blackish purple, lobes widely triangular to deltoid, their tips upright or approaching each other, peduncle hypogeous, 3–6 cm. Style 1.5–2 mm, stigma orbicular, lens-shaped, slightly convex, smooth, pink, diam.12–18 mm. Leaf blade ovate-attenuate, 20–35 × 8–12 cm. (China: Yunnan Prov.). The herbarium of the Chinese Academy of Sciences (PE) holds two older specimen from Northern Vietnam (Li 2004); Kon Tum Prov.: *Averyanov et al. VH 2322* (LE). Type: *Baillon* "s*erres des musee hist. nat. Paris 1926*" (P). Fig. 1 E …. **21. *A. typica*** Baillon

22b. Flower otherwise ……..…… 23

23a. Perigone tube urceolate, diam. 4–7 mm ……..... 24

23b. Perigone tube campanulate, tubular, cup-, funnel-, or bowl-shaped , if urceolate, diam. 12–15 mm ……..…..…….. 25

24a. Perigone diam. 4–5 mm, lobes erect. Leaves 1–2.5 cm wide and up to 65 cm long …… **6. *A. minutiflora*** (see 7a)

24b. Perigone diam. 6–7 mm, urceolate to subglobose , opening 2–3 mm, lobes reflexed, ovate-lanceolate, with two keels. Anthers 6, sessile, at middle height of tube. Pistil table-shaped, stigma flat, diam. 2–3 mm, 3-lobed, each lobe distally with an ascending apex. Leaf blade ovate-attenuate, 17–20 × 5–6 cm. Cao Bằng Prov., Trà Lĩnh Distr. Type: *Averyanov et al. VH 2460* (holo LE, photo M, iso HN) …… **22. *A. cryptantha*** Tillich

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25a. Perigone narrow tubular, yellow, inside purple ……... ……..…….. **15.** ***A. lutea*** (see 17a)
25b. Perigone otherwise ……..……. 26
26a. Perigone tube outside white, sometimes speckled or tinged with red ….…….....…. 27
26b. Perigone outside pale green, yellowish, purple or blackish purple …… 32
27a. Pistil a delicate mushroom, overtopping perigone tube. Stigma hemispherical, pink or red. Style slender. Perigone cupulate, lobes smooth ..…..…….…….... 28
27b. Pistil table shaped, shorter than perigone tube. Stigma flat or moderately convex, white, lobes with shallow longitudinal grooves .....…….... 29
28a. Rhizome slender, long creeping, many branching, imbricately covered with scales. Petiole 10–15 cm. Leaf blades elliptic-cuspidate, 10–12 × 5 cm, kept in horizontal position, forming a dense carpet and hiding the flowers. Peduncle 2–3 cm, perigone lobes purple, reflexed, stigma pale pink. Flowers sparsely distributed along rhizome. Hải Phòng Prov., Cát Hải Distr., Cát Bà Island. Type: holo *Tillich 4458* M, para LE ……..…… **23.** ***A. marasmioides*** Tillich
28b. Rhizome stout, bearing 2–3 leaves close together, petiole 17–25 cm. Leaf blades in upright or oblique position, 15–18 × 6–7.5 cm. Flowers freely visible, perigone lobes blackish-purple, reflexed, stigma striking bright red. Flowers in groups of 2 or 3. Quảng Bình Prov., Minh Hóa Distr. Type: *L.V.Averyanov, P.K.Loc, N.T.Vin & N.S.Khang HAL 11693* (holo HN, iso LE, M). Fig. 1B …… **24.** ***A. coccigera*** Averyanov & Tillich
29a. Perigone lobes lineate, purple, 3–3.5 cm long, 3–4 mm wide, revolute along margin, with three longitudinal grooves, horizontally spreading, tube cupulate to slightly urceolate, 10–12 mm wide and long. Stamens subsessile near base of tube. Pistil table-shaped, shorter than tube, style cylindrical, stigma white, discoid, shallowly 3-lobed. Leaf blade elliptic to narrowly ovate, shortly attenuate at base and apex, 15–25 × 4–6 cm. Tuyên Quang Prov., Na Hang Distr. Type: *P.K.Loc, N.X.Tam, L.Averyanov, HAL 184* (holo MO, iso HN, LE) …… …….. ***A. stellata*** Averyanov & Tillich
29b. Perigone lobes ovate, triangular, or shortly ligulate 30
30a. Perigone shallowly urceolate, diam. 8–10 mm, tube white outside, lobes erect, purple, smooth, in two circles. Anthers subsessile, pollen sacs facing the style, embedded into an unusual broad, fleshy connective. Pistil nearly as long as perigone tube, style stout, stigma moderately convex, white, indistinctly 3-lobed. Peduncles in groups, 5–30(–40) mm long, in more or less horizontal position. Leaf blade lanceolate, 15–35 × 2–5 cm. Thừa Thiên-Huế Prov., Nam Đông Distr. Type: *L. Averyanov HAL 11111b* (holo LE, epitype: d-EXSICCATES OF VIETNAMESE FLORA *0191/HAL 11111b*) ……..……..… ……..… **26.** ***A. zinaidae*** Averyanov & Tillich
30b. Perigone widely cupulate, diam. 25–30 mm, tube outside silvery white, lobes reflexed, pistil half the length of perigone tube. Flower very soon collapsing when detached from the plant ……..… 31
31a. Rhizome stocky. Perigone tube 12–13 mm in diam., inside blackish purple, with a weak constriction in lower third, lobes dark purple, basally with 3–4 shallow longitudinal grooves, surface finely shrivelled. Stamens inserted at the tube constriction, pollen sacs oriented downwards. Style slender, 5–7 mm long, stigma a thin disc, three armed, white, 10 mm in diam. Leaf blade lanceolate, 25–35 × 5–8 cm. Thái Nguyên Prov., Tam Đảo NP. Type: *Tillich 4462* (M) ……..…… **27.** ***A. bicolor*** Tillich
31b. Rhizome slender, long creeping, freely branching, covered with small, triangular, blackish-brown scales. Perigone tube 15–20 mm in diam., inside nearly black, lobes white, ovate, smooth, with ca. 5 fine somewhat sunken nerves. Stamens near base of tube, filaments horizontal, pollen sacs oriented downward. Style slender, 4–5 mm long, stigma disc-shaped, orbicular, with 3 shallow marginal incisions, ca. 8 mm in diam., white, smooth, flat, margins bent downward. Leaf blade ovate, 14–17 × 7–8 cm. Than Hóa Prov.: *HAL 3202,* HN, iso LE. Type: Ninh Bình Prov., Cúc Phương NP: *Tillich 5280* (M). Fig. 1J ……..… ……..… **28.** ***A. fungilliformis*** Y. Wan ***ssp. formosa*** Tillich
Note: *ssp. fungilliformis* is known from China, Guangxi Prov. (Wan, 1984; Li, 2004; Liu et al., 2011). It differs with tube and lobes outside pale purple, lobes oblong, filaments vertical at tube base with anthers facing the style, stigma strikingly convex. Also in Vietnam?).
32a. (26) Flowers numerous, in dense groups. Peduncle 0.5–1 cm, perigone widely funnel-shaped, 9–10 mm in diam., pale green outside, tube inside and lobes purple, lobes ovoid, 4 mm long and wide, smooth, distinctly in two circles. Stigma white, surface flat, 7 mm in diam. Leaves stiff upright, fair green, Leaf blade lanceolate, 30–40 × 2–2.5 cm, very densely along the rhizome. Thừa Thiên-Huế Prov., Bạch Mã NP. Type: *Tillich 4471* (M). …… **29.** ***A. foliosa*** Tillich
32b. Plant otherwise …..…… 33
33a. Perigone tube dull purple, cupular, flower diam. 2–2.3 cm, height 2–2.5 cm; lobes ovate, in two circles, horizontally spreading, white, smooth, with 5 somewhat sunken nerves. Peduncle 1–2 cm, erect. Stamens subsessile at lower quarter of tube; style slender, stigma diam. 11 mm, weakly 3-lobed, white, smooth. Leaf blade ovate-attenuate, 15–20 × 4–5 cm (*Colania tonkinensis* Gagnepain). Ninh Bình Prov., Cúc Phương NP: *Cuong et al. NMC 1167* (MO), Type: Lạng Sơn Prov.: *Colani 3009* in herb. Pételot (P) ……... **30.** ***A. tonkinensis*** (Gagnep.) F.T.Wang & K.Y.Lang
33b. Plant otherwise ……..….. 34
34a. Perigone depressed bowl shaped, 20–25 mm in diam., 10 mm high. Lobes reflexed, deltoid. Flowers numerous. Pistil table-shaped, style 2 mm long, stigma orbicular, discoid, leaving only a narrow slit between its lower surface and base of tube, upper surface flat, cream-white, 10 mm in diam., surface smooth, white, with repeatedly bifurcate radial lines. Leaf blade widely ovate-acuminate, 20–30 × (5–)8–12 cm ……. **31.** ***A. opaca*** Tillich
01a. Perigone outside yellowish or pale greenish, mottled with purplish spots, or tinged with pink, tube inside and upper surface of lobes dull purple-violet, except for their yellow-green tips, smooth. Khán Hòa Prov., ca. 35 km W of Nha Trang. Type: *Tillich 4468* (M) ……..... **31a. var.** ***opaca***
01b. Perigone outside and inside, and lobes (except their pale tips) uniformly purple and finely rugose. Type: Khán Hòa Prov., Cam Lãm Distr. *Rybková & Škorničkova 180* (holo HN, para M, iso SING) ……..… **31b. var.** ***rugosa*** Tillich
34b. Perigone otherwise ……..… 35
35a. Perigone urceolate, diam. at basal third of tube 10–16 mm, distally decreasing to 5–9 mm, lobes ligulate with rounded tips, 6–8 × 4 mm, reflexed ……..…….. 36
35b. Perigone not urceolate ...……..… 37
36a. Lobes with 4 thin, parallel keels 1.2–1.8 mm high, keels distally fusing, basally running down to base of tube. Anthers closely attached to pistil base. Style 2 mm long, stigma hemispherical, 5 mm in diam., upper surface with irregular furrows resembling a brain surface. Leaf blade linear, 60–80 × 2.5–3.5 cm, in herbaria typically blackish brown, with a prominent yellow midrib at lower surface. Cao Bằng Prov., Trà Lĩnh and Thạch An Districts: *Averyanov et al. CBL 840, CBL 879* (HN, MO), Type: Cao Bằng Prov., Trà Lĩnh Distr.: *L.V.Averyanov et al. VH 2456* (holo HN, photo M, iso LE) …….. **32.** ***A. alata*** Tillich
36b. Lobes with two low keels at lower third, cream-white, tube internally and externally dark violet. Anthers at base of tube, clearly distant from pistil. Style 2 mm long, stigma disc-shaped, 10–13 mm in diam., shallowly 3-lobed, surface flat, white or tinged with violet. Leaf blade ovate-lanceolate, 17–30 × 3–9 cm. Đồng Nai Prov., Vĩnh Cửu Distr. Type: *N.A. Vislobokov M 0111* (holo MW, para *N.A. Vislobokov M 0211* MW, *A.N.Kuznetsov et al. 396 & 397* MW) ……..…… **33.** ***A. phanluongii*** N. Vislobokov
37a. Perigone fleshy, splitted into 6 lobes nearly to base, 25–30 mm in diam., with distinct aromatic scent, lobes stiff, carneous, upright,

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35–40 mm long, proximally 10 mm and distally 4–5 mm wide, each adaxially with one very prominent thick keel at lower half. Stamens at base of tube, subsessile, anthers drop-shaped, 2 mm long, connectiveswith distal cylindrical appendage 1 mm long. Stigma sessile on indistinct ovary, widely conic, 16–18 mm in diam., with 6 high radial purple crests. Leaf blade 25–30 × 7–10 cm, margin at distal half finely serrate. Lâm Đồng Distr., Đa Lạt City, Type: *Tillich 4367* (M) …… **34. *A. stricta*** Tillich

37b. Perigone otherwise …… 38

38a. Perigone lobes with 4 rounded keels, widely triangular, 7 mm long and 9 mm wide, perigone subsessile, widely funnel shaped, 25 mm in diam., purple. Stamens at lower third of tube, lineate, anthers 2 mm long. Pistil obconical. Stigma white, flat, with 3 distally incised lobes. Petiole up to 60 cm long, Leaf blade lanceolate, 25 × 5–8 cm. Thừa Thiên-Huế Prov., Bạch Mã NP. Type: *Tillich 4475* (M) …… **35. *A. petiolata*** Tillich

38b. Perigone lobes without keels, flowers nodding on more or less horizontal peduncles, perigone widely bowl shaped …… 39

39a. Perigone 14–15 mm in diam., with nearly flat, fleshy base, reddish purple to deep purple internally and externally, lobes 6(–8), in two whorls, ovate-triangular, erect to slightly patent, outer lobes 6–7 × 8–9 mm, inner lobes 5–6 × 6–7 mm. Stamens inserted at upper end of tube, overtopping stigma surface, anthers somewhat sunken in a thickened rim around upper end of tube, thecae separated by light green connective tissue. Pistil depressed obconical, ca 3 mm high, outer (lower) surface in close contact to perigone wall. Stigma circular, 5–6 mm in diam., cream colored in the slightly convex centre, margin and lower surface tinged with purple red to deep purple. Leaf blade broadly ovate, 20–30 × 8.5–13 cm, apex acuminate, base rounded. Thuyên Quang Prov., Na Hang Distr. Type: *J. L. Škorničkova JLS 1871* (holo SING, iso M, HN) Fig. 1G …… **36. *A. jiewhoei*** Tillich & Škorničkova

39b. Perigone 25–35 mm in diam., 4–5 mm high, with flat, thin walled base, tube and lobes reddish-brown to nearly purplish black internally and externally, lobes broadly triangular-ovate, 6–8(–10) mm long and wide, flat, finely rugose on upper surface, straight or slightly reflexed. Stamens 6, inserted near perigone base. Pistil mushroom-shaped, style stout, cylindrical, 2–3 mm tall, stigma discoid, upper surface finely verrucose, whitish, finely purple mottled along the revolute margin, shallowly 3 lobed, 10–14 mm in diam. Leaf blade narrowly elliptic, 15–22 × 3–5 cm. Khán Hòa Prov., Khánh Vĩnh Distr., Hòn Bà NP, at about 1500 m a.s.l. Type: *J. Regalado, Luu Hong Truong, Tran Gioi JR 1888* (holo LE, epi d-EXSICCATES OF VIETNAMESE FLORA *0198/JR 1888*). Further specimens from the same locality: *Luu Hong Truong & Tran Gioi KH 135, KH 136, KH 144, KH145, KH 146, KH 147, KH 148, KH 149, KH 150* (all stored at SING), *R. Rybkova & J. Škorničkova HB-17* (M). Fig. 1K …… **37. *A. truongii*** Averyanov & Tillich

40a. (13) Perigone tube depressed globoid, 20–22 mm in diam., 12 mm high, externally pale green and finely red mottled, lobes 8(–9), narrow lineate with wider base, 20 mm long, spreading more or less horizontally, purple, distally pale or greenish, with basal appendages of white colour with purple margins, forming an iris diaphragm like structure reducing the tube opening. Stamens 8, at base of tube. Pistil table-shaped, enclosed in tube, stigma disc-shaped, 18 mm in diam., surface purple and white with 4 heart-shaped areas in the centre and 16 prominent rays ending in 16 teeth. Leaf blade widely lanceolate, 16–18 × 5–7.5 cm. Ninh Bình Prov., Cúc Phương NP. Type: holo *Tillich 4358* (M), para *Bogner 2346* (M), *Tillich 4480* (M), *Tillich 4980* (MO). Fig. 1N …… **38. *A. superba*** Tillich

40b. Flower otherwise …… 41

41a. Perigone lobes lineate, 17–20 mm long, stigma hemispherical to dome-shaped, emerging from tube …… 42

41b. Perigone lobes triangular, not exceeding 10 mm in length, stigma not overtopping tube …… 44

42a. Perigone lobes 8–10, lineate, flat, smooth, connate at their tips and forming a cage around the stigma, externally (i.e. lower surface) pale violet with dark purple spots, internally purple. Stamens 8, near base of tube. Pistil mushroom-shaped, style 2–4 mm long, stigma dome-shaped, 12–17 mm in diam., surface smooth, marmorate with dark and pale purple. Leaf blade lanceolate, 30 × 5(–6) cm. Gia Lai, Kon Tum and Thừa Thiên-Huế Provs. Type: Gia Lai Prov.: holo *Tillich 4470* (M), para *Bogner 2502* (M). Fig. 1H …… **39. *A. connata*** Tillich

Note: also in China, Guangxi Prov., close to the border to Vietnam: *Xu Wei-bin, 17101* (IBK)

42b. Perigone lobes 8(–9), horizontally spreading, margins revolute …… 43

43a. Stigma and upper surface of lobes of same colour, finely rugose, homogeneously brown-red, pistil mushroom-shaped, 9 mm long, style 4–5 mm, stigma hemispherical, 9 mm in diam. Lobes 20 mm long, on basal third with two low keels, outer (lower) surface of lobes green. Leaf blade broadly lanceolate, 20–30 × 6–9 cm. Thừa Thiên-Huế Prov., Bạch Mã NP. Type: *Tillich 4598* (M) Fig. 1O …… **40. *A. geastrum*** Tillich

43b. Stigma smooth, dome-shaped, white or occasionally speckled with red, pistil mushroom-shaped, style 4 mm, stigma 14 mm in diam. Lobes 17–19 mm long, with 2 prominent keels, each keel basally fused with a keel of the adjoining lobe. Figs. 1 L&P …… **41. *A. subrotata*** Y.Wan & C.C.Huang

01a. Leaf blade ovate-lanceolate, 25–30 × 7–9 cm, on upper surface midvein deeply sunken, left and right of midvein 4–5 secondary veins sharply protruding above upper surface of Leaf blade. Thái Nguyên Prov., Tam Đảo NP. Type: *Tillich 4461* (M) …… **41a. var. *crassinervis*** (Tillich) Phonsena

Note: also known from NE Thailand (PHONSENA & DE WILDE 2010).

01b. Upper Leaf blade surface smooth, without protruding veins …… 02

02a. Leaf blade oblong-lanceolate, 26–44 × 5.5–7.7 cm. China: Guangxi Prov. Type: *C.C.Huang & Y.Wan 12263* (holo GXMG, iso GXSP); Vietnam: TháiNguyên Prov., Tam Đảo NP: *Tillich 4459* (M) …… **41b. var. *subrotata***

02b. Leaf blade lineate-lanceolate, (1–)2–2.5 cm wide. NE Thailand. Type: *Phonsena, Duyfjes & de Wilde 6333* (holo BKF, iso BK, K, L). also in Vietnam? …… **41c. var. *angustifolia*** Phonsena

44a. Perigone black-purple to black violet, campanulate, flowers numerous, densely arranged along rhizome, lobes triangular, with yellow tips, suberect or slightly bent outward, with two prominent keels, each keel basally fusing with a keel of the adjoining lobe, there forming a protruding lip. Stamens inserted at lower third of tube. Pistil obconical, 7–8 mm tall, stigma 8–9 mm in diam., shallowly convex, pale violet, with 4 moderate marginal incisions. Hải Phòng Prov., Cát Hải Distr., Cát Bà Island …… **42. *A. arnautovii*** Tillich

01a. Leaf blade stiff, kept erect to horizontal, lanceolate, 20–30 × 4–4.5 cm, dark green with small white spots. Perigone 20–25 mm in diam. and 18–20 mm tall. Type: holo *Tillich 4474* (M), para *Tillich 4211* (M), *Tillich 4956* (MO), *Tillich 4957*, *5178* (LE) …… **42a. var. *arnautovii***

01b. Leaf blade flabby, soft, thin, hanging over, widely lanceolate, 25–30 × 6–8 cm, fair green with small pale green spots. Perigone 17–20 mm in diam. and 13–15 mm tall. Type: *Tillich 4460* (M) …… **42b. var. *catbaensis*** Tillich

44b. Perigone purple …… 45

45a. Flower 14–15 mm in diam., nodding at more or less horizontal peduncle, lobes smooth. Pistil obconical. Stamens overtopping stigma …… **36. *A. jiewhoei*** (see 37a)

45b. Flower 25–30 mm in diam., erect, subsessile or peduncle 3–6 mm long, perigone broadly cup-shaped to shallowly urceolate, tube 10–15 mm in diam., outside glossy red-purple, inside dark purple-violet, lobes triangular, 6–8 mm long , fleshy, rugose, reddish-pink to yellowish, with 2(–3) prominent keels. Stamens at lower quarter of tube, hidden below stigma. Pistil mushroom-

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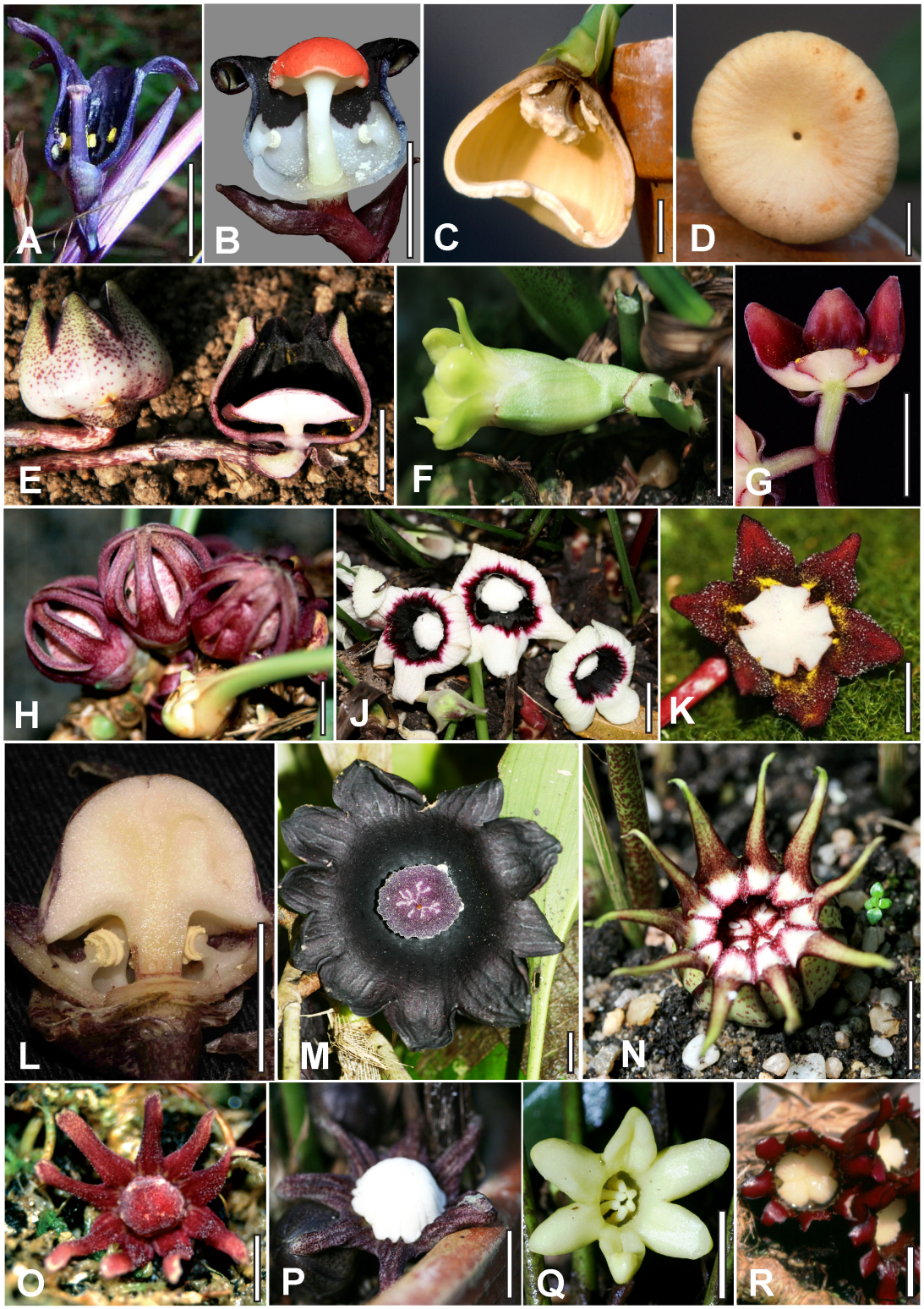


Fig. 1: Flower diversity in Vietnamese *Aspidistra* species. A: *A. atroviolacea*, flower in longisection. B: *A. coccigera,* flower in longisection. C: *A. locii*, flower in longisection. D: *A. locii*, view to the minute perigone opening. E: *A. typica*, flower in external view and in longisection. F: *A. lutea*. G: *A. jiewhoei*, flower in longisection. H: *A. connate*. J: *A. fungilliformis* ssp. formosa. K: *A. truongii*. L: *A. subrotata,* pistil in longisection. M: *A. nikolaii*. N: *A. superba*. O: *A. geastrum*. P: *A. subrotata*. Q: *A. brachystyla*. R: *A. bogneri*. Fotos: A, B, M & Q: L. Averyanov; G: J. Škorničkova; K: R. Rybkova; all others: H.-J. Tillich. Scale bar: 1 cm.

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shaped, style stout, stigma fleshy, 8–10 mm in diam., indistinctly 4(–8)-lobed, stigma lobes irregularly folded forming prominent, partially crispy radial ridges and deep grooves, stigma margins straight or sligthly upcurved. Leaf blade lanceolate to narrowly elliptic, 20–30 × 3–6 cm. Quảng Nam Prov., and in a number of limestone areas in northwestern Vietnam. Type: Quảng Nam Prov., Đông Giang Distr., *L. Averyanov, P.K.Loc, P.V.The, N.T.Vinh, HAL 12116a* (LE, epitype: d-EXSICCATES OF VIETNAMESE FLORA *0179*/*HAL 12126a*) ……
…. **43. *A. elatior*** Blume **var. *vietnamensis*** Averyanov & Tillich

New combination

Aspidistra arnautovii* var. *catbaensis Tillich ***comb. nova***

Basionym: *A. arnautovii* Tillich ssp. *catbaensis* Tillich in Feddes Repertorium 116: 316 (2005)

New Variety

Aspidistra opaca Tillich var. ***rugosa*** Tillich, Vietnam, Khán Hòa Prov., Cam Lãm Distr.: *Romana Rybková & Jana Škorničkova 180* (holo HN, para M, iso SING).

The new variety differs from the type variety with perigone deep purple externally and internally with finely rugose surfaces, perigone lobes deep purple with rugose upper surface (not dull purple-violet with yellow tips, and smooth surface).

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越南的蜘蛛抱蛋屬（天門冬科）

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摘要：回顧越南蜘蛛抱蛋屬的歷史，顯示過去十年來此屬在物種數上的大量成長。本文針對目前越南蜘蛛抱蛋屬下43個現存物種，設計了較以往更廣泛、更全面的檢索表，以期對將來的物種鑑定、田野調查能有所助益，也希望未來能刺激更多對這多樣化的屬之相關研究。

關鍵詞：蜘蛛抱蛋屬、天門冬科、越南植物誌、授粉。

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