Aspidistra anomala, A. elegans and A. sinensis spp. nov. (Asparagaceae, Convallariaceae s.s.) from China, Laos and Vietnam

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The recently discovered *Aspidistra anomala*, *A. elegans*, and *A. sinensis* are described and illustrated as species new to science. All novelties are local endemics of limestone areas of mainland southeast Asia.

This paper contains new results of a successive investigation of the species diversity of the genus Aspidistra Ker-Gawl. (1822, p. 628), which has a significant center of richness in mainland southeastern Asia (Huang 1986, Li 1988, 2004, Lang et al. 1999, Liang and Tamura 2000, Tang and Liu 2003, Bogner and Arnautov 2004, Tillich et al. 2007, Tillich 2008, 2014, Tillich and Averyanov 2008, 2012, Lin and Liu 2011, Liu et al. 2011, Averyanov and Tillich 2012, 2013, 2014, 2015, Lin et al. 2012, 2013, 2014, 2015, Hu et al. 2014, Meng et al. 2014, Vislobokov et al. 2014, Olivier 2015). It includes illustration and descriptions of three new species discovered in southern China, central Laos and northern Vietnam. All described species are local endemics of karstic limestone areas. The species description, appropriate type citations, data on ecology, phenology, distribution, expected IUCN red list status and notes on plausible phylogenetic relations are provided for each species. When the new data provided here are included, the known number of Aspidistra species in eastern Indochina exceeds 50.

Aspidistra anomala Aver. & Tillich sp. nov. (Fig. 1)

Type: 26 May 2015, L. Averyanov, L. Osnovetz, CPC 1605a (holotype: LE). First collected in northern Vietnam (Hoa Binh province, Lac Son district, Ngoc Son municipality, Khu village, around point 20°26′31″N, 105°19′32″E, primary broadleaved forest on steep rocky slopes of remnant mountain composed with solid crystalline highly eroded limestone at 550–650 m a.s.l., 27 Mar 2011. N. Q. Hieu, L. Averyanov, N. T. Hiep, P. K. Loc, P. V. The, N. T. Vinh, T. B. Ngan, N. Tap, D. D. Dao, V. T. Ha, T. Maisak, L. Osnovetz CPC 1605). The type specimen was prepared from cultivated plants in May 2015.

Etymology

The species epithet refers to the anomalous flower structure.

Description

Terrestrial perennial herb with orthotropic stem, forming no rhizome. Shoot dirty brownish, erect, simple or sparsely branched near the base, 10-15 cm tall, (4.5)5.0-6.0(7.0) mm in diameter, densely nodal, with few thick, rigid, semiwoody, straight, down-directed prop roots. Cataphylls convolute, narrowly triangular, when young glossy green, later becoming dull pale gray-brownish to light yellowish-gray, papyraceous, with prominent nerves, up to 6 cm long, early splitting into persistent fibrous remains. Leaves on individual shoots (2)3(4), petiolate. Petiole stiff, erect, almost straight or slightly curved near apex, (7)8-16(18) cm long. Leaf blade almost horizontal to slightly ascending, narrowly ovate to elliptic, cuneate at base and shortly attenuate at apex, (10)12-16(18) cm long, (2.5)3.0-5.0(6.0) cm wide, irregularly broadly undulate along margin, dark uniformly green on both sides, with (5)7 prominent veins radiating from the leaf base. Flowers solitary, arising from leaf axil in apical part of shoot, pedunculate, nodding, widely opening, 2.2-2.6 cm across, in morning sweet fragrant, later with rather unpleasant mushroom odor. Peduncle arising vertically, arching and drooping, light green, terete, slightly swelling to the apex, (0.8)1.2-1.5(2.0) cm long, (2.5)3.0-3.5(4.0) mm in diameter, with 3-4(5) sterile bracts approximated at apex and near the base; bracts broadly triangular ovate, concave, thin, slightly keeled dorsally, scarious, white to light greenish near apex, papyraceous, acute to shortly attenuate, (5)6-10(12)mm long and wide (being flattened). Perigone tube campanulate, pure white or slightly yellowish toward the base on both surfaces, fleshy, smooth and glossy, (10)12-14(16) mm long and wide, with (7)8(9) free, irregularly unequal lobes at apex. Perigone lobes more or less smooth, glossy, pure white, triangular ovate in outline, unequal in size and shape, strongly irregularly deformed, obtuse to acute at apex, straight, twisted, recurved, or incurved, (occasionally some lobes strongly incurved and united at apex with stigma),



Figure 1. Aspidistra anomala sp. nov. Digital epitype, L. Averyanov and L. Osnovetz, CPC 1605a. Photos, correction and design by L. Averyanov.

(3)5-7(9) mm long, (2.0)3.0-6.0(7.5) mm wide at base, irregularly undulate, incised and gnawed along the margin, shallowly auriculate at the base. Stamens 6(7), almost sessile, inserted on tube wall at third of its length from the base; anthers narrowly triangular, curved, unguiculate, often deformed, (5.5)6.0-7.0(7.5) mm long, (2.0)2.5-3.0(3.5) mm wide, their connective dorsally with tall, prominent keel and large, incurved, claw-shaped extension reaching 2-3 mm beyond tips of pollen sacs; pollen sacs introrse; pollen bright yellow. Pistil terete, sub-clavate; style white, fleshy, cylindrical, slightly thickened at the base and apex, straight to slightly curved, 9-11 mm tall, (0.8)0.9-1.0(1.1) mm in diameter at the base; stigma truncate or hardly convex, elliptic as seen from above, (1.8)2.0(2.2) by 0.4-0.5 mm, with 4-6 low, dull yellowish, indistinct bosses on almost flat terminal surface. Ovary inconspicuous, very indistinct, light greenish. Fruits globular, dark green.

Distribution

Northern Vietnam (Hoa Binh province, Lac Son district). Endemic.

Habitat, phenology and conservation status

Terrestrial herb with semi-woody erect stem, growing in primary lowland broad-leaved evergreen forests on solid crystalline highly eroded limestone, commonly on shady, steep, rocky slopes, 550–650 m a.s.l. Flowers in cultivation in May–June. The species was observed as a common plant and is probably not in need of any special protection.

Similar species

Aspidistra anomala belong to small group of species with erect stem forming no rhizome (including Aspidistra khangii Aver. and Tillich (2014, p. 752), A. locii Arnautov & Bogner (Bogner and Arnautov 2004, p. 203), A. nikolaii Averyanov & Tillich (Tillich and Averyanov 2008, p. 37), A. laotica Aver. & Tillich (2015, p. 366), A. lateralis Tillich (2005, p. 320), A. lubae Averyanov and Tillich (2014, p. 752), and A. erecta Y. Liu & C.-I Peng (Liu et al. 2011, p. 367)). However, it differs from all its congeners in anomalous (looking aberrant), pure white flowers, flattened stigma, carinate, and curved anthers with prominent, claw-shaped connective extension. This very distinct, easily distinguished species was observed as very common and even abundant in its habitat in primary shady limestone forest understory.

Aspidistra elegans Aver. & Tillich sp. nov. (Fig. 2)

Type: 6 May 2015, L. Averyanov, LA–VN 432a (holotype: LE). First collected in central Laos, Vientiane province, Vang Vieng district, Phol Xai village, about 8 km to the west of Vang Vieng town, Phar Poon Mt, around point 18°56'11.5"N, 102°20'05.0"E, dry broad-leaved primary and secondary evergreen forest on very steep rocky slopes and on vertical cliffs of remnant highly eroded rocky limestone mountains composed by solid crystalline limestone at elevation 300–900 m a.s.l., 15 Mar 2013, N. T. Hiep, L. Averyanov, N. S. Khang, P. V. The, S. Lorphengsy LA-VN 432. The type specimen was prepared from cultivated plants in May 2015.

Etymology

The epithet refers to the elegant shape and coloration of the flowers.

Description

Terrestrial perennial herb with short, plagiotropic, epigeous, few-branching rhizome. Rhizome thick, stout, (0.5)1.0-2.5(3.5) cm long, (4)5-6(7) mm in diameter, densely covered by imbricate, partially disintegrated, dull, light brownish, papyraceous bracts (1.0)2.0-4.5(6.0) cm long, (4)5-6(8) mm wide. Shoots densely clustering, ascending to erect, stout, short, simple, 0.5-1.5(2.0) cm tall, (6)8-10(12) mm in diameter, densely nodal, with few thick, underground roots at the base. Cataphylls convolute, tubular, narrowly triangular to lanceolate (being flattened), light greenish to dull violet, herbaceous, later scarious, papyraceous, pale yellowish, longitudinally nerved, recurved, (1)2-6(8) cm long, (4)5-10(12) mm wide. Leaves on individual shoots (2)3-4(5), petiolate. Petiole stiff, erect, almost straight, (5)8–12(14) cm long. Leaf blade almost horizontal, oblique ovate to elliptic, cordate at base and shortly attenuate at apex, (10)12-18(22) cm long, (5)6-8(9) cm wide, irregularly broadly undulate along margin, dark uniformly green on both sides, with (5)7-9 prominent veins radiating from the leaf base. Flowers solitary, arising from basal part of shoot, pedunculate, odorless, widely opening, (1.6)1.8-2.0(2.2) cm across. Peduncle arising horizontally, ascending to suberect, dirty dull purple-brownish, terete, (0.8)1.0-3.5(4.0) cm long, (1.4)1.6-2.0(2.2) mm in diameter, with (3)4-6(7) sterile distant bracts; bracts broadly triangular ovate, concave, thin, white, speckled and veined with purple-brownish, scarious, papyraceous, blunt to obtuse, (5)6-10(12) mm long, (3)4-6(8) mm wide (being flattened). Perigone tube campanulate to cupulate, or almost hemispheric, pure white on both surfaces, fleshy, smooth and glossy, (7)8-10(11) mm long and wide, with 6 free lobes at apex. Perigone lobes subequal, more or less flat and smooth, glossy, adaxially dull dark violet, with black-violet venation, abaxially white to dull dirty greenish with dirty violet tint near margins, 3-veined, grooved along veins, ovate to almost semi-circular, well recurved, (5.5)6.0-7.0(7.5) mm long and wide, rounded at apex; sepals (outer perigone lobes) slightly wider and shallowly auriculate at the base. Stamens 6, almost sessile, inserted on tube wall near the middle or slightly higher; anthers bean-shaped, (1.8)2.0(2.2) mm long, (1.4)1.5-1.6(1.8) mm wide; pollen sacs introrse; pollen light dull yellow. Pistil pure white, mushroom-shaped; style fleshy, cylindrical, (5.5)6.0-7.0(8.0) mm tall, (1.6)1.8-2.0(2.2) mm in diameter at the base, slightly broadening to the base and apex; stigma umbrella-like, 5.5-6.5 mm in diameter, entire, almost circular, convex, with shallow broad irregular lobes, fleshy, its upper surface irregularly bossed. Ovary inconspicuous, very indistinct, white. Fruits dirty green, rugose, globular, 1.0–1.5 cm in diameter.

Distribution

Central Laos (Vientiane province, Vang Vieng district). Endemic.



Figure 2. Aspidistra elegans sp. nov. Digital epitype, L. Averyanov, LA-VN 432a. Photos, correction and design by L. Averyanov.



Figure 3. Aspidistra sinensis sp. nov. Digital epitype, L. Averyanov and P. Efimov, garden no. 12659a. Photos, correction and design by L. Averyanov.

Habitat, phenology and conservation status

Terrestrial creeping herb growing in primary and secondary broad-leaved evergreen dry forests on highly eroded rocky crystalline limestone, usually on shady rocky slopes, 300– 500(900) m a.s.l. Flowers in cultivation in April–May. The new species was observed in its locality as a very common plant of primary forest understory at elevation at 300– 500 m a.s.l. At higher elevation, it becomes rare, but occasionally occurs at elevations up to 800–900 m a.s.l. It needs no protection at present.

Similar species

Aspidistra elegans has probably its closest relation to *Aspidistra coccigera* Aver. & Tillich (Tillich and Averyanov 2012, p. 202) from which it differs mainly by smaller leaves with twice-shorter petioles, longer perigone tube, twice-smaller stamens, pure white stigma, shorter pedicels and rugose, greenish (not prickly, purple) fruits.

Aspidistra sinensis Aver. et Tillich sp. nov. (Fig. 3)

Type: 15 Oct 2014, L. Averyanov, P. Efimov, garden no. 12659a (holotype: LE). First collected in southeastern China, Guangxi Zhuang Autonomous Region, Baise City, Jingxi County, Tongling Grand Canyon (south Gate) near Sino-Vietnamese border (Cao Bang province, Trung Khanh district) around point 23°01′82N, 106°65′71E, secondary broad-leaved evergreen forest on rocky karstic limestone at elevation 800–1000 m a.s.l., 22 Jul 2012, E. Arnautova s.n., garden no. 12659. The type specimen was prepared from cultivated plants in October 2014.

Etymology

The epithet refers to the species' country of origin.

Description

Terrestrial perennial herb with very short, epigeous, simple or few-branching, plagiotropic rhizome. Rhizome thick, stout, (0.5)1.0-1.5(2.0) cm long, (4)5-6(7) mm in diameter, densely covered by imbricate, partially disintegrated, dull, brown, papyraceous bracts (6)8-15(20) mm long, (2)3-4(5) mm wide. Leafy shoot at apex of rhizome, ascending to erect, stout, short, simple, 0.5-0.8(1.0) cm tall, (3)4-5(8) mm in diameter, densely nodal, with few thick, whitish, underground roots at the base. Cataphylls conduplicate, distichous, narrowly triangular (being flattened), dull violet, herbaceous, later papyraceous, light brown, longitudinally veined, straight to recurved, (0.6)0.8–1.4(2.0) cm long, (2)3-4(5) mm wide. Leaves on individual shoots (2)3-4(6), shortly petiolate. Petiole stiff, erect or oblique, almost straight, (2.0)2.5-3.5(4.0) cm long. Leaf blade leathery, almost horizontal, obliquely narrowly ovate to elliptic, rounded or subcordate at base and shortly attenuate at apex, (14)16-20(25) cm long, (5)6-10(12) cm wide, irregularly broadly undulate along margin, dark glossy green on both sides, with many small yellow spots and numerous indistinct veins radiating from the leaf base. Flowers solitary, arising from basal part of shoot, shortly pedunculate, odorless, about 1 cm across. Peduncle arising horizontally, white, heavily spotted with purple, (3.5)4.0-5.0(6.0) mm long, (1.6)1.8-2.0(2.2) mm in diameter, with 3-4(5) sterile imbricate bracts; bracts broadly triangular ovate, concave, thin, white, spotted and speckled with purple, scarious, papyraceous, blunt to obtuse, (4)5-10(12) mm long, (4)5-8(10) mm wide (being flattened). Perigone tube cupulate, outside white, spotted and speckled with purple, inside dark purple-brown, white at the base, fleshy, smooth and glossy, (6.0)6.5-8.0(9.0) mm long, (5.5)6.0-7.0(7.5) mm wide, with (6)7 free lobes at apex. Perigone lobes subequal, slightly concave, finely rough, glossy, dark purple-brown on both surfaces, narrowly ovate to ovate, straight and erect, cucullate, (4.5)5.5-7.0(7.5) mm long, (3.5)4.0-4.5(5.0) mm wide, rounded at apex; petals (inner perigone lobes) slightly wider and shallowly auriculate at the base. Stamens (6)7, almost sessile, inserted on tube wall just below the middle; anthers narrowly ovoid to oblong, (1.8)2.5-3.8(4.2) mm long, (1.0)1.2-1.5(1.6) mm wide; pollen sacs introrse; pollen light dull yellow. Pistil white in lower half, purple and obconoid in apical half; style fleshy, cylindrical, broadening to the apex, (6.5)7.0–9.0(9.5) mm tall, (2.2)2.5-3.0(3.2) mm in diameter; stigma shortly obconoid, truncate, 5.5-6.5 mm in diameter, circular in outline, shallowly irregularly lobed, fleshy, papillose, whitish, flushed with purple in center. Ovary inconspicuous, very indistinct, white. Fruits unknown.

Distribution

Southeastern China (Guangxi autonomous region, Jingxi county, Tongling Grand Canyon). Endemic.

Habitat, phenology and conservation status

Terrestrial creeping herb growing in primary and secondary submontane broad-leaved evergreen forests on rocky karstic limestone, commonly on shady, steep, rocky slopes. 800– 1000 m a.s.l. Flowers in cultivation in June–July and October. Not common, but currently there are not enough data for assessing the IUCN conservation status of this species.

Similar species

Aspidistra sinensis may be close to A. zongbayi K. Y. Lang & Z. Y. Zhu (1982, p. 486) and A. lobata Tillich (2006, p. 141), from which it differs in perigone tube white and purple speckled (not uniform purple), tube 6–7 mm across (not 8–12 mm), perigone lobes erect, cucullate, without keels (vs reflexed, with two or four keels, flat tips), anthers near middle of tube, oblong, 2.5–3.8 mm long (not near base of tube, ovate, 1.0–1.5 mm long), and stigma obconical (not disc-shaped).

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