A new species of *Arisaema* (Araceae) from Vietnam

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*Arisaema langbiangense* (Araceae) is described and illustrated as a new species from Langbiang Mountain, Bidoup-Nui Ba National Park, Lac Duong District, Lam Dong Province, Vietnam. A morphological comparison between the new species and its closest congeners and a key to all known species of *Arisaema* sect. *Anomala* in Vietnam are given.

**Introduction**

*Arisaema* Martius (1831: 459) of the Araceae is a genus of around 200 species occurring primarily in temperate regions of Asia, but with species also in the Asian tropics, East Africa, and North America (Li, 1981; Mayo et al., 1997; Renner et al., 2004; Gusman & Gusman, 2006; Boyce et al., 2012). In Vietnam, 21 species of *Arisaema* have been recorded (Bruggeman et al., 2013; Gagnepain, 1941 & 1942; Gusman & Gusman, 2006; Hoang et al., 2015; Luu et al., 2013 & 2014; Nguyen, 1998, 2000, 2002, 2005 & 2007; Nguyen & Boyce, 2005; Pham-hoang, 2000).

Section *Anomala* Gusman & Gusman (2003: 40), one of the 15 sections of *Arisaema*, comprises 29 species (Gusman & Gusman, 2006; Bruggeman et al., 2013). According to Nguyen & Vu (2009), in Vietnam the section was known to include eight species: *A. balansae* Engler (1920: 163), *A. garrettii* Gagnepain (1941: 125), *A. omkoiense* Gusman (2001: 3), *A. petelotii* Krause (1932: 332), *A. petiolulatum* Hooker (1893: 6), *A. pingbianense* H.Li (1988: 99), *A. rostratum* V.D.Nguyen & P.C.Boyce (2005: 37), and *A. victoriae* V.D.Nguyen (2000: 38). More recently, *A. claviforme* Bruggeman (Bruggeman et al., 2013: 558) was described from Vietnam as new to science and *A. lihengianum* Murata (2003: 83) was recorded as new to the flora of Vietnam (Hoang et al., 2015). Therefore, prior to this paper, the total number of known species *Arisaema* sect. *Anomala* in Vietnam was ten.

In January 2014, we conducted a field trip to the Langbiang Mountain in Bidoup-Nui Ba National Park, Lam Dong Province and encountered a flowering population of a distinctive *Arisaema* species of section *Anomala*. Our careful examination of its morphological attributes indicated that the species differed from all the earlier described species in section *Anomala* and it is thus proposed here as a new species.

**Taxonomy**

*Arisaema langbiangense* Luu, Nguyen-phi & H.T.Van, sp. nov. (Fig. 1)

Allied to *A. bannaense*, *A. claviforme*, *A. garrettii* and *A. petiolulatum* but different in having green flesh of rhizome, long pseudostem, forwards bent spadix appendix and 5(6)-lobed obovoid ovaries.

Type:—VIETNAM. Lam Dong Province, Lac Duong District, Bidoup-Nui Ba National Park, Langbiang Mountain, about 108°26′58″E, 120°29′N, 1702 m in elevation, 18 January 2014, *Van Hong Thien* H.T.Van 06 (holotype SGN!, isotypes SGN! & PHH!).

Recommended Vietnamese name:—Nam tinh Langbiang

Herb evergreen, 30–55 cm high. Stem a subterranean cylindrical rhizome, 5–9 cm long, 1.5–2 cm wide, white-grey outside, green inside. Cataphylls 2–4, greenish brown, reddish brown mottled, 20–22 cm long. Leaf: 1 to 3; the last petiole and peduncle sheathing into pseudostem (*sensu* Gusman & Gusman, 2006) at lower part, free above; pseudostem 22–26 cm long, greenish brown, reddish brown mottled; free part of the petiole 9–11 cm long, brownish green with spare reddish brown mottling. *Leaf blade* trifoliolate, *leaflets* equal in size, 14–16 cm long, 7–10 cm wide, dark green above, pale green under side, apex acuminate with up to 2 cm, caudate tip, midrib impressed adaxially and...
prominent abaxially, lateral veins diverging from the midrib and collective vein at ca. 0.3 cm from margin, central leaflet ovate, with base rounded, petiolule ca. 2 cm long, lateral leaflets asymmetrical, with base rounded, petiolule ca. 0.8 cm long. Inflorescence solitary; free part of the peduncle 18–20 cm long, ca. 1 cm in diameter, green, with sparse reddish brown mottling; spathe tube cylindrical, green, 7–9 cm long, ca. 1 cm in diameter; spathe limb ovate, curved over mouth, 4–5 cm long, 2.5–3 cm wide, green, translucent, ending in a ca. 1 cm caudate tip. Male spadix 6–7 cm long; appendix slightly exserted from tube mouth, 3.5–4 cm long, naked, ca. 0.4 cm in diameter at base, ca. 0.2 cm in diameter at apex, green, cylindrical, apex round and smooth; male zone 2.5–3 cm long, synandrium of 2 or seldom 3 stamens, loosely arranged, on a ca. 2 mm long stipe; theca purple or cream with purple top and dehiscent by dark purple round pore at anthesis. Bisexual spadix 5.5–6.0 cm long; appendix slightly exserted from tube mouth, 1–1.5 cm long, naked, ca. 0.4 cm in diameter at base, ca. 0.2 cm in diameter at apex, cylindrical, apex round and smooth; female zone ca. 1.5 cm long, 0.5–1 cm in diameter, ovaries obovoid, green, 5(6)-lobed, ca. 2 mm in diameter, 1-locular, with 3–4 bottle-shaped ovules, densely arranged; stigma born on a thick 1 mm long style; male zone ca. 2 cm long, synandrium of 2 or seldom 3 stamens, loosely arranged, on a 1–2 mm long stipe; theca horseshoe-shaped, cream with purple top and dehiscent by dark purple round pore at anthesis.

Habitat:—Arisaema langbiangense grows on humus and wet places under tropical evergreen forest at elevations of around 1,700 m.

Eponymy:—The new species is named after its type location, Langbiang Mountain.

Distribution:—Arisaema langbiangense is only known from the type location.

Taxonomic discussion:—Arisaema langbiangense obviously belongs to section Anomala and it is most closely relative to A. bannaense H.Li (1988: 101), A. claviforme, A. garrettii and A. petiolulatum, in having: evergreen habit, subterranean rhizomatous stem, trifoliolate leaf and fleshy spadix appendix with naked apex slightly exserted from the tube mouth. However, it is distinct in having green flesh of its rhizome - an attribute first reported for the genus, long pseudostem, forwards bent spadix appendix and 5(rarely 6)-lobed obovoid ovaries (Table 1). In addition, it can be distinguished from A. bannaense and A. garrettii in having ovate spathe limb without strong constriction at base and more slender spadix appendix. It is different from A. claviforme as the latter has an obviously club-shaped spadix appendix, inconspicuous pseudostem and 3 to 4-androus synandria. Arisaema petiolulatum differs from the proposed new species in having one leaf with elliptic central leaflet, unmottled petiole, spathe limb with strong constriction at base and thecae opened by an apical slit (Pham-hoang, 2000; Gusman & Gusman 2006; Li et al., 2010). All the other species of the section known from Vietnam are readily distinguishable from the new species as they have filiform bristles on the spadix appendix.

<p>| TABLE 1. Comparison of Arisaema langbiangense with its morphologically close species. |</p>
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>A. langbiangense</th>
<th>A. bannaense</th>
<th>A. claviforme</th>
<th>A. garrettii</th>
<th>A. petiolulatum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flesh of rhizome</td>
<td>green</td>
<td>purplish</td>
<td>violet</td>
<td>purplish white</td>
<td>violet</td>
</tr>
<tr>
<td>Pseudostem</td>
<td>present</td>
<td>absent or very short</td>
<td>absent or inconspicuous</td>
<td>absent or very short</td>
<td>absent</td>
</tr>
<tr>
<td>Spathe tube</td>
<td>cylindrical, whole green</td>
<td>subcylindrical, pale green</td>
<td>subcylindrical, pale green</td>
<td>subcylindrical, pale green</td>
<td>subcylindrical, greenish white</td>
</tr>
<tr>
<td>Spathe limb</td>
<td>ovate, without constriction at base</td>
<td>obovate, with strong constriction at base</td>
<td>ovate, without constriction at base</td>
<td>obovate, with strong constriction at base</td>
<td>ovate-lanceolate, with strong constriction at base</td>
</tr>
<tr>
<td>Dehiscence of thecae</td>
<td>by dark purple round pore</td>
<td>by apical united slit</td>
<td>by elongated pore</td>
<td>by oblong pore</td>
<td>by apical slit</td>
</tr>
<tr>
<td>Spadix appendage</td>
<td>lower half conical, upper half cylindrical, with round apex, bent forwards</td>
<td>cylindrical, with subclavate apex, erect</td>
<td>cylindrical, with club-shaped apex, erect</td>
<td>cylindrical, with clavate apex, erect</td>
<td>narrowly cylindrical, with round apex, erect</td>
</tr>
<tr>
<td>Ovaries</td>
<td>obovoid, 5(rarely 6)-lobed</td>
<td>ovoid, not lobed</td>
<td>ovoid, not lobed</td>
<td>ovoid, not lobed</td>
<td>oblong, not lobed</td>
</tr>
</tbody>
</table>
Key to the species of *Arisaema* from Vietnam

Based on the available literature (Pham-hoang, 2000; Gusman & Gusman 2006; Li et al., 2010; Boyce et al., 2012; Bruggeman et al., 2013; Hoang et al., 2015) and the authors’ field observations, the known Vietnamese species of *Arisaema* sect. *Anomala* can be distinguished by the following key:

1  Flesh of rhizome green ........................................................................................................... *A. langbiangense*
   - Flesh of rhizome purplish or violet .................................................................................. 2
2  Spadix appendix naked at apex ........................................................................................... 3
   - Spadix appendix with few or many filiform bristles at apex ................................................ 5
3  Spadix appendix club-shaped .............................................................................................. *A. claviforme*
   - Spadix appendix cylindrical ............................................................................................ 4
4  Spathe limb ovate ............................................................................................................... *A. petiolulatum*
   - Spathe limb obovate ........................................................................................................ *A. garrettii*
5  Pseudostem present, long .................................................................................................. 6
   - Pseudostem absent or inconspicuous ................................................................................ 7
6  Limb plain green ................................................................................................................. *A. petelotii*
   - Limb with white zone at base .......................................................................................... 8
7  Spathe limb plain green ..................................................................................................... *A. victoriae*
   - Spathe limb with white zone at base ............................................................................... 9
8  Spadix appendix 3.5 cm long, peduncle shorter than petiole .................................................... *A. omkoiense*
   - Spadix appendix 9–10 cm long, peduncle longer than petiole ................................................ *A. balansae*
9  Spadix appendix entirely covered with numerous filiform bristles ..................................... *A. lihengianum*
   - Spadix appendix with few filiform bristles at apical centimetre only ................................ *A. pingbianense*

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