

# Studies on the *Alocasia* clade (Araceae) of Peninsular Malaysia I: *Alocasia farisii* sp. nov. from limestone in Kelantan

Zulhazman Hamzah, Norzielawati Salleh and Peter C. Boyce

Z. Hamzah (zulhazman@umk.edu.my), Faculty of Earth Science, Univ. Malaysia Kelantan, Jeli Campus, Jeli, Kelantan, Malaysia. – N. Salleh, Forest Research Inst. Malaysia (FRIM), Kepong, Selangor, Malaysia. – P. C. Boyce, Systematische Botanik und Mykologie, Dept Biologie I, Ludwig-Maximilians-Univ. München, Germany. PCB also at: Inst. for Tropical Biology and Conservation, Univ. Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia.

*Alocasia farisii* Zulhazman, Norzielawati & P. C. Boyce is described and illustrated from Karst limestone in Kelantan as the first recorded Peninsular Malaysian species of the hitherto wholly Bornean *Alocasia princeps* complex, within which *A. farisii* most closely resembles the southwest Sarawak limestone-obligated *Alocasia reversa* N. E. Br.

In contrast to traditional classifications, the most recent phylogenetic analyses of Araceae (Cusimano et al. 2011, Nauheimer et al. 2012a, b) reveal *Alocasia* G. Don as not closely related to genera such as *Colocasia* Schott, but instead forming a well-supported separate clade with *Leucocasia gigantea* (Blume) Schott. Consequently Colocasieae (sensu Mayo et al. 1997) can no longer be used for the *Colocasia-Alocasia* alliance because it lacks phylogenetic support. While Alocasiinae exists formally (Schott, Synopsis *Aroidearum complectans* 1856, p. 43) its rank is inappropriate and in any case its historical usage is incongruent with the reconstructed phylogeny.

*Alocasia* comprises about 100 species, including diminutive to massive pachycaul-arborescent terrestrial or epilithic mesophytes, rather rarely helophytes, distributed from the subtropical eastern Himalayas throughout subtropical and tropical parts of Asia into the western Pacific and eastern Australia. *Alocasia* is uniquely defined by the presence of waxy glands in the axils of the primary and occasionally secondary veins on the abaxial surface of the leaf blade (the exception being *Alocasia brisbanensis* (F.M. Bailey) Domin). Additional (but not unique) characteristics are clear or somewhat milky acrid sap, staminate flowers forming synandria, and fruits ripening to orange-scarlet berries.

Although revised for much of its range (Hay and Wise 1991, Hay 1998, 1999, Boyce and Sookchaloem 2012) *Alocasia* remains poorly understood and new species are regularly being discovered (Hay 1994,

2000, Hay et al. 1997, Yuzammi and Hay 1998, Boyce 2007, Kurniawan and Boyce 2011, Wong and Boyce 2016).

When revising *Alocasia* for Peninsular Malaysia, Hay (1998) recognized five species, one of which, viz the pantropical naturalized *A. macrorrhizos* (L.) G. Don, was considered doubtfully native. The other species are *Alocasia inornata* Hallier f., *A. longiloba* Miq. (treated as an ochlo species, Cronk 1998), *A. perakensis* Hemsl., and *A. puber* (Hassk.) Schott. None of these are endemic to Peninsular Malaysia and although some expressions of *A. longiloba* are limestone-associated, none of the species appears geologically constrained (Mashhor et al. 2012).

Against this background, investigation of the biologically diverse Karst limestone formations of Kelantan (northeast Peninsular Malaysia) has highlighted a small epilithic species of *Alocasia* (Fig. 1, 2B), clearly not matching any of those treated in Hay (1998), nor pertinent to any species occurring in neighbouring Thailand (Boyce and Sookchaloem 2012). Plants maintained in cultivation at University Malaysia Kelantan recently flowered and revealed themselves to be an undescribed species morphologically congruent with the till now wholly Bornean *Alocasia princeps* complex (Hay, 1998), in which the Kelantan plants most closely resemble *A. reversa* N. E. Br. (Fig. 2A, 3), a species restricted to limestone in southwest Sarawak, Malaysian Borneo, but from which they differ as per the diagnosis presented below.

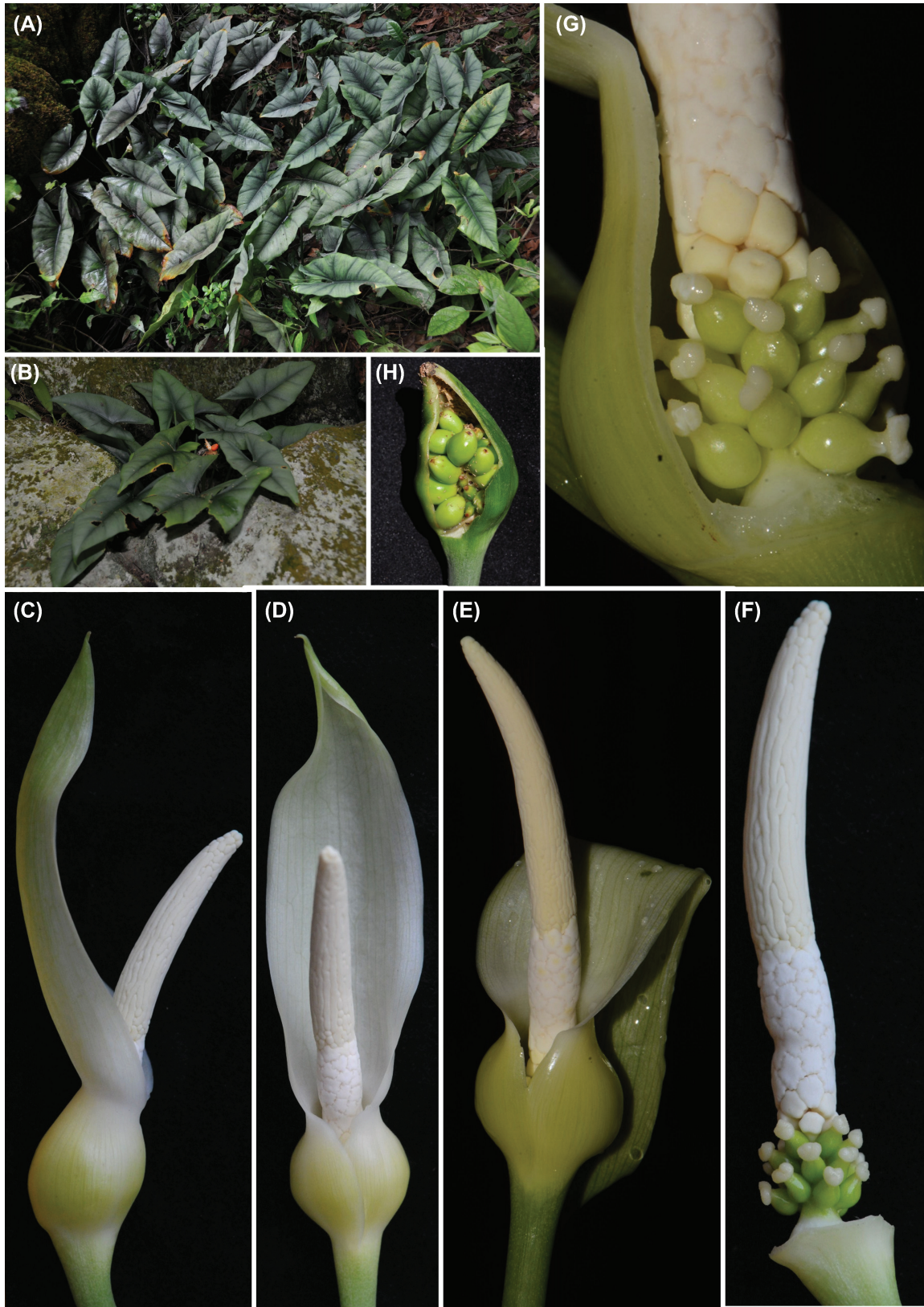


Figure 1. *Alocasia farisii* sp. nov. (A)–(B) plants in habitat, (C)–(D) inflorescence at pistillate anthesis, (E) inflorescence at early staminate anthesis, (F) spadix at pistillate anthesis, spathe artificially removed, (G) detail of pistillate flower zone, interstice, and lower part of staminate flower zone, (H) sub-mature infructescence, nearside artificially removed.





Figure 2. *Alocasia reversa* and *A. farisii* sp. nov. compared. *Alocasia reversa* (A) spadix at pistillate anthesis, spathe artificially removed. *Alocasia farisii* (B) spadix at pistillate anthesis, spathe artificially removed.

***Alocasia farisii* Zulhazman, Norzielawati & P. C. Boyce sp. nov. (Fig. 1, 2B)**

A species most similar to the Bornean *Alocasia reversa*, notably by the leaf blades adaxially grey-green and distinctly dark green about main veins and primary veins, and by having at least some plants with some or all of the leaf blades peltate, but differing by having staminate flower zone only half enclosed in the lower spathe chamber (vs staminate flower zone almost entirely enclosed), by ellipsoid (vs globose) lower spathe, by the spathe lacking a purple margin, and by fewer and less well-developed interstice synandrodies.

**Type:** Malaysia, Kelantan, Tanah Merah, Jentian Forest Reserve, ca 05°29'14.5"N, 102°01'44.5"E, 6 Jul 2011, Norzielawati S. UMK00190 (holotype: Herbarium, Faculty of Earth Science, Univ. Malaysia Kelantan).

**Eponymy**

*Alocasia farisii* is named for HRH Tengku Mohammad Faris Petra Ibni Tengku Ismail Petra, now known as Sultan Mohamad V, the Sultan of the Malaysian State of Kelantan, in recognition of his great enthusiasm in conserving rare and endemic species in Kelantan.

**Description**

Small epilithic, seldom terrestrial, mesophytic herb to ca 55 cm tall but mostly about half this height. Rhizome elongated, erect, later distally decumbent, ca 2.5 cm in diameter. Leaves several together, irregularly interspersed with semi-fleshy, later marcescent brown cataphylls to ca 7 cm long. Petioles ca 10–25 cm long, smooth, pale green, sheathing in the lower 1/3–1/2. Leaf blades thinly leathery; juvenile blades peltate with posterior lobes united for 60–90% of their length; on adult plants mostly all non-peltate, occasionally mixed peltate and non-peltate in some individuals, hastato-sagittate to slightly ovato-sagittate, 4 × 6 cm to 10 × 13 cm, glossy dark green along the midrib and primary veins adaxially, the remainder grey-green. Inflorescences 1–2 together, subtended by lanceolate membranous pale green, later marcescent brown, cataphylls; peduncle ca 7–13 cm long at anthesis, smooth, pale green; spathe ca 7–12 cm long; lower spathe ca 2 cm long, ovoid, creamy to very pale yellow; limb pale green at the tip, remainder creamy white, the colour extending into the constriction ventrally, at first erect, then sharply deflected, oblong lanceolate, mucronate for ca 10 mm; spadix somewhat shorter than the spathe; stipe ca 3 mm, conical, green. Pistillate flower zone ca 0.7 cm long; pistils somewhat loosely packed, flask-shaped, facing obliquely upwards; style slender; stigma 2-lobed, white; interstice with 2–3 rows of pearl-like staminodes, these ca 3 mm in diameter, dull pale cream. Staminate flower zone ca 1.5 cm long, 4 mm in diameter, subcylindric, slightly constricted ca 1/3 from the base corresponding to spathe constriction; synandria rhombo-hexagonal ca 2.5 mm across, 4–6-merous, opening by apical pores; synconnective not expanded, ivory white; appendix roughly isodiametric with staminate flower zone, ca 2.5 cm long, gradually tapering to a blunt point, faintly longitudinally brain-like channelled, dull pale cream. Fruiting spathe broadly ovoid, ca 4 cm long; berries bright orange.

**Distribution and ecology**

*Alocasia farisii* is so far known only from the Karst limestone areas of Jentian (Tanah Merah, ca 05°29'14.5"N, 102°01'44.5"E), Gua Musang, and Gua Ikan–Gua Pagar (Kuala Krai, ca 05°21'14.5"N, 102°01'35.3"E), Kelantan, northeast Peninsular Malaysia. It grows as a lithophyte in soil and humus pockets on limestone outcrops and boulders, rather occasionally as terrestrial, on seasonally dry lightly forested Karst formations, 80–160 m a.s.l.

**Biogeographical considerations**

The discovery of *Alocasia farisii*, a species belonging to an otherwise Bornean taxon complex, in Peninsular Malaysia, provides yet more indications of the close biogeographical relationship that exists for plants in northeast Malay Peninsular and Borneo, postulated as the “Riau Pocket” phytochore by Corner (1960), and elaborated by Ashton (2005) and Ahmad Sofiman and Boyce (2010).

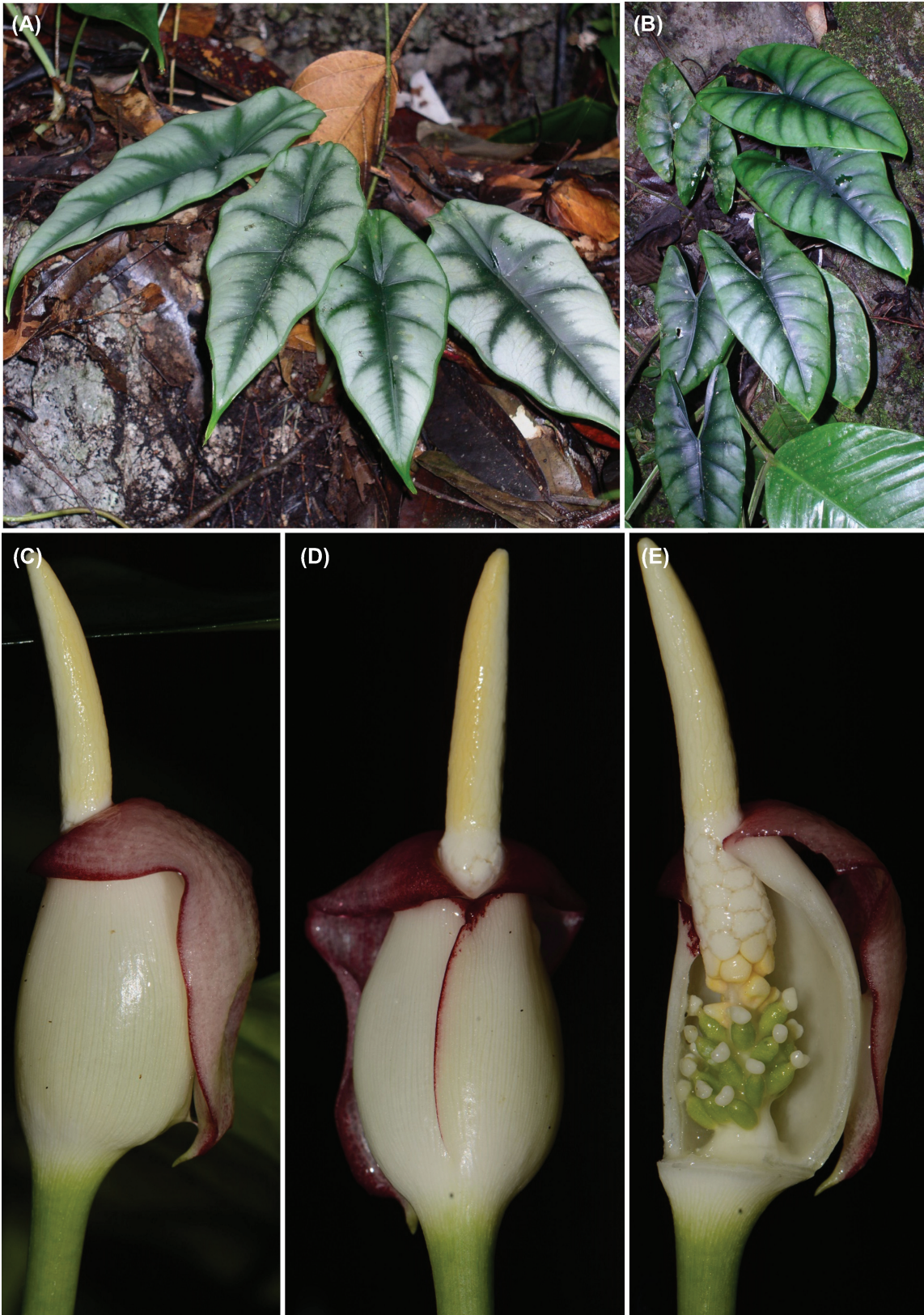


Figure 3. *Alocasia reversa* (A)–(B) plants in habitat. Note that leaf blades in (A) are peltate while those in (B) have basal lobes completely free, (C)–(D) inflorescence at late pistillate anthesis, (E) spadix at late pistillate anthesis, spathe artificially removed.



*Acknowledgements* – The authors would like to thank the Dept of Earth Science, Univ. Malaysia Kelantan and the Kelantan State of Forestry Dept of giving permission to done the survey in forest reserves and also the Univ. Malaysia Kelantan for financial funding through the short-term research grant R/SGJP/A03.00/00279A/001/2009/000021.

## References

- Ahmad Sofiman, O. and Boyce, P. C. 2010. Studies on Monstereae (Araceae) of Peninsular Malaysia II: *Rhaphidophora latevaginata*, newly recorded from west Malaysia. – Gard. Bull. Singap. 62: 1–8.
- Ashton, P. S. 2005. Lambir's Forest: The world's most diverse known tree assemblage? – In: Roubik, D. W. et al. (eds), Pollination ecology and the rain forest: Sarawak Studies, Springer, pp. 191–216.
- Boyce, P. C. 2007. Studies on the *Alocasia* Schott (Araceae–Colocasieae) of Borneo: I. Two new species from Sarawak, Malaysian Borneo. – Gard. Bull. Singap. 58: 141–154.
- Boyce, P. C. and Sookchaloem, D. 2012. *Alocasia*. – In: Boyce, P. C. et al. (eds), Flora of Thailand (Acoraceae and Araceae). Vol. 11. R. For. Dept, Bangkok, pp. 18–30, plates V–XI.
- Cronk, Q. C. B. 1998. The ochlopecies concept. – In: Huxley, C. R. et al. (eds), Chorology, taxonomy and ecology of the floras of Africa and Madagascar. R. Bot. Gard. Kew, pp. 155–170.
- Corner, E. J. H. 1960. The Malayan Flora. – In: Purchon, R. D. (ed.), Proceedings of the Centenary and Bicentenary Congress of Biology, pp. 21–24.
- Cusimano, N. et al. 2011. Relationships within the Araceae: comparison of morphological patterns with molecular phylogenies. – Am. J. Bot. 98: 654–668.
- Hay, A. 1994. *Alocasia simonsiana* – a new species of Araceae from New Guinea. – Blumea 38: 331–333.
- Hay, A. 1998. The genus *Alocasia* (Araceae–Colocasieae) in West Malesia and Sulawesi. – Gard. Bull. Singap. 50: 221–334.
- Hay, A. 1999. The genus *Alocasia* (Araceae–Colocasieae) in the Philippines. – Gard. Bull. Singap. 51: 1–41.
- Hay, A. 2000. *Alocasia nebula*. – Bot. Mag. 17: 14–18, pl. 381.
- Hay, A. et al. 1997. *Alocasia melo*. – Bot. Mag. 14: 82–86, pl. 315.
- Hay, A. and Wise, R. 1991. The genus *Alocasia* (Araceae) in Australasia. – Blumea 35: 499–545.
- Kurniawan, A. and Boyce, P. C. 2011. Studies on the *Alocasia* Schott (Araceae–Colocasieae) of Borneo II: *Alocasia baginda*, a new species from East Kalimantan, Indonesian Borneo. – Acta Phytotax. Geobot. 60: 123–126.
- Mashhor, M. et al. 2012. The Araceae of Peninsular Malaysia. Pulau Pinang: Penerbitan Univ. Sains Malaysia, pp. 146.
- Mayo, S. J. et al. 1997. The genera of Araceae. – R. Bot. Gard. Kew xi + 370 pp.
- Nauheimer, L. et al. 2012a. Giant taro and its relatives: a phylogeny of the large genus *Alocasia* (Araceae) sheds light on Miocene floristic exchange in the Malesian region. – Mol. Phylogenet. Evol. 63: 43–51.
- Nauheimer, L. et al. 2012b. Global history of the ancient monocot family Araceae inferred with models accounting for past continental positions and previous ranges based on fossils. – New Phytol. 195: 938–950.
- Wong, K. M. and Boyce, P. C. 2016. Novitates Bruneienses, 6. *Alocasia azlanii* (Araceae), a new species from Brunei. – Acta Phytotax. Geobot. 67: 185–189.
- Yuzammi and Hay, A. 1998. *Alocasia subirmaniana* (Araceae–Colocasieae): a spectacular new aroid from Sulawesi, Indonesia. – Telopea 7: 303–306.