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A synopsis of the multilocular species of *Ixora* (Rubiaceae) from Madagascar

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Abstract

Two new *Ixora* species from Madagascar are described, *Ixora lagenifructa* and *I. quadrilocularis*. *Ixora littoralis*, previously positioned in the monospecific genus *Thouarsiora*, is newly named *I. homolleae*. These three species are characterized by 4-locular ovaries and fruits, 4-lobed stigmas, large fruits with thick walls and well-developed calyces. A fourth species, *I. trimera*, shows the same characters but its ovaries are 2-, 3- or 4-locular and its stigmas are 2-, 3- or 4-lobed. A dichotomous key, detailed descriptions and distribution maps are given for these four species, the only multilocular ones in Madagascar.

Introduction

In Madagascar the genus *Ixora* Linneaus (1753: 110) comprises ca. 40 species, half of which remain undescribed. This paper is the fourth in a series of precursors to a revision (De Block 2007, 2008; De Block & Van De Kerckhove 2009), and treats the multilocular species, i.e. those with more than two locules, present on the island.
In Africa and Madagascar, the genus *Ixora* is easily recognized by the following characters: articulate petioles; articulate, trichotomously branched, terminal inflorescences; 4-merous flowers with long, cylindrical corolla tubes; free stigmatic lobes; uni-ovulate locules; drupaceous fruits; and seeds with a large adaxial excavation extending into a basal groove (De Block 1998). In the past, to this list of key characters would be added: ovaries and fruits 2-locular and stigma 2-lobed. Several small genera, closely related to *Ixora* and often considered as satellite taxa, were described to accomodate species with more than two locules. The Madagascan monospecific genus *Thouarsiora* Homolle ex Arènes (1960: 19) was described for a 4-locular species with uniflorous inflorescences, *Thouarsiora littoralis* Homolle ex Arènes (1960: 19). In the Mascarenes, two genera comprised species with dioecious or functionally dioecious flowers, short corolla tubes and 2–7-locular ovaries: *Myonima* Commerson ex Jussieu (1789: 206) with four species and *Doricera* Verdcourt (1983: 37) with a single species. In the Pacific, *Hitoa* Nadeaud (1899: 2) was established for a species with 2–6 flowers per inflorescence and 3- or 4-locular ovaries and fruits. Over time, it was realized that the number of locules is not a discriminating character after all, and, one by one, these genera were placed in synonymy with *Ixora*: *Hitoa* by Darwin (1979) and *Thouarsiora* by Guédès (1986) as previously suggested by Capuron (1969: 48). Guédès (1986) also emended the description of the genus *Ixora* to include species with 3- and 4-locular ovaries and 3- and 4-lobed stigmas. In a molecular phylogenetic study of the tribe Ixoreae, Mouly *et al.* (2009) confirmed the synonymy of *Hitoa* and *Thouarsiora* with *Ixora* and also placed *Doricera* and *Myonima* in synonymy with *Ixora*. This resulted in an even broader circumscription of *Ixora* including species with up to seven locules per ovary.

Species having ovaries with more than two locules are rare within the ca. 530 species (Davis et al. 2009) of *Ixora*, but they do occur in several parts of the distribution range: the Mascarenes (*Myonima*, *Doricera*), the Pacific Region (*Hitoa*), Australia [*Ixora baileyana* Bridson & L.G.Adams in Adams et al. (1987: 214)] and Madagascar (*Thouarsiora*). The presence of more than two locules is sometimes correlated with dioecy or functional dioecy as in *Myonima*, *Doricera* and *Ixora baileyana* (Adams *et al.* 1987, Tosh *et al.*, 2013), but this is not the case in *Hitoa* or in the Madagascan species. The phylogenetic analysis published by Mouly *et al.* (2009, p. 152, fig. 2) clearly shows that the switch from two to more locules occurred independently several times in the evolution of *Ixora*. Furthermore, even in Madagascar this switch seems to have occurred more than once. In a molecular study on the

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References

Adams, L.G., Bridson, D.M. & Robbrecht, E. (1987) The identity of *Lasianthus graciliflorus* Bailey (Rubiaceae). *Kew Bulletin* 42: 209–214.
http://dx.doi.org/10.2307/4109904

Anonymous (1962) Systematics Association committee for descriptive biological terminology. II. Terminology of simple symmetrical plane shapes (chart 1). *Taxon* 11: 145–156.
http://dx.doi.org/10.2307/1216718

Arènes, J. (1960) A propos de quelques genres Malgaches de Rubiacées. *Notulae Systematicae (Paris)* 16: 6–19.

Bremekamp, C.E.B. (1957) Les Lathraeocarpées, tribu nouvelle des Rubioïdées (Rubiacées). *Bulletin du Jardin Botanique de l'Etat, Bruxelles* 27: 159–166.
http://dx.doi.org/10.2307/3666986

Capuron, R. (1969) A propos des Rubiacées-Vanguériées de Madagascar. *Adansonia, ser. 2*, 9: 47–55.

Darwin, S.P. (1979) A synopsis of the indigenous genera of Pacific Rubiaceae. *Allertonia* 2: 1–44.

Davis, A.P., Govaerts, R., Bridson, D.M., Ruhsam, M., Moat, J. & Brummitt N.A. (2009) A global assessment of distribution, diversity, endemism, and taxonomic effort in the Rubiaceae. *Annals of the Missouri Botanical Garden* 96: 68–78.
http://dx.doi.org/10.3417/2006205

De Block, P. (1998) The African species of *Ixora* (Rubiaceae-Pavetteae). *Opera Botanica Belgica* 9: 1–218.

De Block, P. (2007). Three new Madagascan *Ixora* species (Rubiaceae) with flowers up to 25 cm long. *Nordic Journal of Botany* 25: 75–84.
http://dx.doi.org/10.1111/j.0107-055x.2007.00111_7.x

De Block, P. (2008) Synopsis of the uniflorous Madagascan *Ixora* (Rubiaceae) species belonging to section *Microthamnus. Belgian Journal of Botany* 141: 141–156.

De Block, P. & Van De Kerckhove, O. (2009) *Ixora foliicalyx*. *Flowering Plants of Africa* 61: 132–138.

Gmelin, J.F. (1791) *Caroli a Linné, systema naturae* 2 (1). Beer, Lipsiae, i–xl + 884 pp.

Govaerts, R., Ruhsam, M., Andersson L., Robbrecht E., Bridson, D., Davis, A., Schanzer, I. & Sonké, B. (2013) *World Checklist of Rubiaceae.* Royal Botanic Gardens, Kew. Available from: http://apps.kew.org/wcsp/ (January 2013).

Groeninckx, I., De Block, P., Rakotonasolo, F., Smets, E. & Dessein, S. (2009) Rediscovery of Madagascan *Lathraeocarpa* reveals its taxonomic position within Rubiaceae. *Taxon* 58: 209–226.

Guédès, M. (1986) Ixoras malgaches nouveaux à fleurs solitaires. *Phytologia* 60: 243–250.

Hochreutiner, B.P.G. (1908) Sertum madagascariense. Etude systématique de deux collections de plantes récoltées à Madagascar par M.M. J. Guillot et H. Rusillon. *Annuaire du Conservatoire et du Jardin Botaniques de Genève* 11–12: 35–135.

Jussieu, A.L. de (1789) *Genera plantarum secumdum ordines naturales disposita*. Herissant & Barrois, Paris, 498 pp.
http://dx.doi.org/10.5962/bhl.title.7762

Lamarck J.-B. de (1792) *Tableau encyclopédique et méthodique des trois règnes de la nature. Botanique*, tome 1. Panckoucke, Paris, iii–xvi + 496 pp.

Linnaeus, C. (1753) *Species Plantarum*. Impensis Laurentii Salvii, Stockholm, 560 pp.

Merril, E.D. (1910) New or noteworthy Philippine plants, VIII. *The Philippine Journal of Science* 5: 167–257.

Mouly, A., Razafimandimbison, S.G., Florence, J., Jeremie, J. & Bremer, B. (2009) Paraphyly of I*xora* and new tribal delimitation of Ixoreae (Rubiaceae): inference from combined chloroplast (rps16, rbcl, and trnT-F) sequence data. *Annals of the Missouri Botanical Garden* 96: 146–160.
http://dx.doi.org/10.3417/2006194

Nadeaud, J. (1899) Plantes nouvelles des Iles de la Société. *Journal de Botanique (Morot)* 13: 1–8.

Robbrecht, E. (1988) Tropical woody Rubiaceae: Characteristic features and progressions. Contributions to a new subfamilial classification. *Opera Botanica Belgica* 1: 1–271.

Schatz, G.E., Lescot, M., Rogers, Z., Sikes, K., Andriambololonera, S., Raharimampionona, J. & Wolf, A.-E. (2003) *Gazetteer to Malagasy Botanical Collecting Localities*. Available from: http://www.mobot.org/MOBOT/Research/madagascar/gazetteer/.

Tosh, J., Dessein, S., Buerki, S., Groeninckx, I., Mouly, A., Bremer, B., Smets, E.F. & De Block, P. (2013). Evolutionary history of the Afro-Madagascan *Ixora* species (Rubiaceae): species diversification and distribution of key morphological traits inferred from dated molecular phylogenies. *Annals of Botany* 112: 1723–1742.
http://dx.doi.org/10.1093/aob/mct222

Verdcourt, B. (1983) Notes on Mascarene Rubiaceae. *Kew Bulletin* 37: 521–574.
http://dx.doi.org/10.2307/4109725

Vogel, E.F. de (1987) *Manual of herbarium taxonomy: theory and practice*. UNESCO, Indonesia, 164 pp.