



EuphORBia: a global inventory of the spurges

H.-J. Esser¹, P.E. Berry², R. Riina²

Key words

electronic resources
Euphorbia
Euphorbiaceae
virtual monograph

Abstract The EuphORBia project, a global inventory of the giant genus *Euphorbia*, is introduced. The project began recently under the auspices of the U.S. National Science Foundation's program in Planetary Biodiversity Inventories (PBI).

Published on 30 October 2009

The Planetary Biodiversity Inventory (PBI) program of the U.S. National Science Foundation is designed to conduct worldwide, species-level systematic inventories of major groups of organisms. Currently seven projects are funded, of which five are zoological, and two botanical:

- 'The *Solanum* PBI Project: Taxonomy in the Electronic Information Age' started in January 2004; and
- 'EuphORBia: a global inventory of the spurges' started in October 2006.

The *Euphorbia* PBI project will run for five or six years. Its main goals are:

- field research in areas poorly explored or with high diversity;
- herbarium and literature studies to solve taxonomic problems;
- a web-based virtual monograph;
- a molecular-based phylogeny of the genus with more complete sampling than previous studies;
- studies on the development of the cyathium.

Training opportunities for graduate and undergraduate students, preferably from the developing world will also be included.

The web-based monograph shall provide users, among others, with

- a digital library of the protologues;
- a species nomenclator (i.e. a list of accepted names and synonyms);
- species pages with descriptions, photographs, maps, conservation status for all species;
- species identification tools, such as web-based interactive keys, using LUCID3 software.

EuphORBia will cooperate with the International Euphorbia Society, www.euphorbia-international.org. Its journal, *Euphorbia World*, will be a suitable forum for the publication of taxonomic notes and novelties. An introduction to the project was already published there (Berry & Riina 2007).

A single project web interface will be provided to access all information, at www.euphorbiaceae.org (already online but with limited information as yet).

In addition, a 'Poinsettia portal' will be intended for educational purposes.

Recent molecular studies (Steinmann & Porter 2002, Bruyns et al. 2006, Steinmann et al. 2007) showed that the genus *Euphorbia* is only monophyletic if numerous generic segregates of *Euphorbia* are included within it, such as *Chamaesyce*, *Cubanthus*, *Monadenium*, *Pedilanthus*, *Poinsettia*, and others. In this broad sense, *Euphorbia* includes at least 2 000 species, and is therefore one of the largest non-apomictic genera of flowering plants; only few genera of phanerogams include more species, e.g., *Astragalus* (*Leguminosae*).

The genus *Euphorbia* in this broad sense is characterized by the cyathium. This is an unusual pseudanthium unique in the plant kingdom, consisting of a pistillate flower surrounded by several staminate flowers, all very much reduced to a single ovary resp. stamen, and surrounded by a ring of bracteal glands and appendages often appearing like a corolla. The cyathium seems to be a reliable synapomorphy and key innovation for the genus.

Euphorbia has a worldwide distribution. Centres of diversity are

- Eastern Africa (succulent species);
- Madagascar (several unique lineages, such as the *Lacanthus* group including the Crown-of-thorns, *E. milii* Des Moul.);
- the Caucasus region (in particular herbs of the *Esula* group);
- Mexico.

The diversity of *Euphorbia* in Malesia is comparatively low, with c. 45 species to expect (Van Welzen 1997), not all of these being indigenous.

Nevertheless, the diversity in life forms here is high, ranging from weedy herbs (e.g., *E. thymifolia* L.) to cactoid shrubs (e.g., *E. antiquorum* L.) and tuberous geophytes (e.g., *E. ridleyi* Croizat). In particular these geophytes are of special interest for the phylogeny and biogeography of the whole genus.

There is still no up-to-date revision of Malesian *Euphorbia* available. This project will hopefully encourage and enable the revision of *Euphorbia* for Flora Malesiana. Cooperation with botanists from Malesia and neighbouring regions will be appreciated.

¹ Botanische Staatssammlung München, Menzinger Straße 67, 80638 München, Germany; e-mail: esser@bsm.mwn.de

² University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287, USA; e-mail: peberry@umich.edu, riina@umich.edu

REFERENCES

- Berry PE, Riina R. 2007. A new collaborative research project: a global inventory of Euphorbia. *Euphorbia World* 3: 12–13.
- Bruyns PV, Mapaya R, Hedderson T. 2006. A new subgeneric classification for Euphorbia (Euphorbiaceae) based on molecular data. *Taxon* 55: 397–420.
- Steinmann VW, Porter JM. 2002. Phylogenetic relationships in Euphorbieae (Euphorbiaceae) based on ITS and *ndhF* sequence data. *Annals of the Missouri Botanical Garden* 89: 453–490.
- Steinmann VW, Van Ee B, Berry PE, Gutiérrez J. 2007. The systematic position of *Cubanthus* and other shrubby endemic species of Euphorbia (Euphorbiaceae) in Cuba. *Anales del Jardín Botánico de Madrid* 64: 123–133.
- Van Welzen PC. 1997. Malesian Euphorbiaceae Newsletter 6. Rijksherbarium/Hortus Botanicus Leiden, The Netherlands; also available at <http://www.nationaalherbarium.nl/euphorbs/Newsletter/Newsletter6.htm>.