



## Comparative seed morphology of the Antillean genus *Calycogonium* (Melastomataceae: Miconieae) as a source of characters to untangle its complex taxonomy

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### Abstract

In order to assess seed morphology 47 species of Miconieae (Melastomataceae) from the Antilles were studied. The majority of these species belong to *Calycogonium*, a complex genus that has been shown to be polyphyletic, but for which we lack for many species any recent and suitable material for molecular systematics studies. A better understanding of homoplastic versus synapomorphic seed characters may therefore be helpful to illuminate the affinities of such species. Some taxa from *Clidemia*, *Miconia*, *Ossaea*, *Pachyanthus* and *Tetrazygia* were also sampled due to their morphological similarities with some species of *Calycogonium*. Variable seed characters include overall shape and size, raphe shape and size, and testa sculpturing. Based on these characters we grouped the species in five seed types, and an additional three species were found to have distinctive seeds that were not grouped with any other species. Species with identical seed types often belong to more than one genus as currently classified. There are five groups of species within *Calycogonium* characterized by similar seed morphology but none of the respective seed types is exclusive to the genus. Some of these seed types correlate well with previously proposed subgeneric groups of *Calycogonium* based on flower morphology and presences and type of leaf domatia. While the occurrence of some seed characters and states matches species groups in *Calycogonium* also found with molecular phylogenetic analyses, seed morphology generally indicates relationships of *Calycogonium* and allied taxa of the Caribbean clade that are not completely reflected by the current generic classification. The study provides a matrix for seed characters of the included species that will serve further phylogenetic reconstruction and analyses of character evolution.

**Key words:** Antilles, *Calycogonium*, Caribbean clade, *Charianthus*, *Clidemia*, *Leandra*, Melastomataceae, *Miconia*, Miconieae, *Mommsenia*, *Ossaea*, seed morphology, *Tetrazygia*

### Introduction

The Caribbean islands are one of the most important hotspots of biodiversity in the world (Myers *et al.* 2000). The plant family Melastomataceae is the fifth most diverse plant family within the Caribbean region with close to 450 species (from 28 genera); of which almost 400 are endemic (Acevedo-Rodríguez & Strong 2012, Michelangeli & Bécquer-Granados 2012). The majority of these endemic species (approximately 330) belong to the tribe Miconieae (Michelangeli *et al.* 2008). The taxonomy of the Miconieae is notoriously complex; taxa are mostly circumscribed based on floral characters that are highly variable and that make species and generic limits often difficult to establish (Judd & Skee 1991, Martin *et al.* 2008). However, current phylogenetic analyses have shown that there are several well supported clades that also correspond with unique morphological characters, some of which were not traditionally used in the family (Michelangeli *et al.* 2004, Bécquer-Granados *et al.* 2008, Goldenberg *et al.* 2008, Martin *et al.* 2008, Michelangeli *et al.* 2008). Some of these characters are related to seed morphology and appear to be synapomorphies for various groups of species (Michelangeli 2000, 2005, Martin *et al.* 2008, Martin & Michelangeli 2009).

This resemblance is, without a doubt, due to convergence given the fact that species that have the “Chionophyla” seed type are in *Miconia* section *Chaenopleura* (Rich. ex de Candolle 1828: 197) Triana ex Bentham & Hooker (1867: 764) and section *Cremanium* (Don 1823: 284) Triana ex Bentham & Hooker (1867: 764) from the Andes, and are not closely related to *T. brachycentra* (Goldenberg *et al.* 2008).

In summary, we see that seed morphology confirms the phylogenetic heterogeneity of *Calycogonium* that has been previously observed based on molecular data (Bécquer-Granados *et al.* 2008, Goldenberg *et al.* 2008, Michelangeli *et al.* 2008). Even though this contradicts the Judd & Skee (1991) concept of *Calycogonium* as a likely monophyletic genus, two of the three subgeneric groups proposed by them based on flower morphology and leaf domatia appear to be supported (with some slight modifications) by information from seed morphology. Compared to characters used in traditional generic delimitations (e.g. petal shape, inflorescence position, merosity) seed morphology seems to be less homoplastic and therefore, seed characters better match those entities within *Calycogonium* and related species of the Caribbean clade thus far recovered in molecular phylogenetic analyses. The fact that seed characters are often in line with specific features from placentation, inflorescence, hypanthium, and anther morphology indicates that they will help to more accurately place those species in a phylogenetic context for which there is no DNA data available. This is especially important for Caribbean species, many of which are known only from a handful of collections and for which recent specimens are not available, thus making DNA isolation unfeasible with current techniques. This study provides a detailed character matrix of the seed morphology that can be integrated into a larger taxon sampling and complemented by data from other organs. Due to taxonomic complexity of the Caribbean clade, it will be particularly useful to expand the taxon sampling in *Tetrazygia*, and the Caribbean endemics of *Miconia* (currently in sections *Amblyarrhena* and *Octomeris*), *Ossaea* and *Clidemia*. Of course, a thorough evaluation within a molecular phylogenetic context is also necessary wherever material becomes available.

## Acknowledgements

EBG would like to thank Dr. Richard Abbott and Dr. Walter Judd for their support during his stay at University of Florida (UF) in 2005, The New York Botanical Garden (NYBG) for its support during his stay at this institution in 2009, and also the Botanic Garden and Botanical Museum Berlin-Dahlem (BGBM) especially the Association of Friends of the Botanic Garden for their support during his stay at this institution in 2010 and 2011 in the course of the Flora de Cuba program. EBG is also indebted to Karen L. Kelley and Lynda Schneider of SEM Laboratory of UF, Lisa Campbell and Harinder Mater of NYBG and Christine Grüber of BGBM for their assistance with SEM work. We also thank Harinder Mater for images of *Calycogonium tetragonolobum* and *C. angulatum*. We are grateful to the herbarium curators of B, GH, HAC, HAJB, JBSD, JE, NY and US for loans of *Calycogonium*, *Clidemia*, *Miconia*, *Ossaea*, *Pachyanthus* and *Tetrazygia* materials. Portions of this research were funded by grant DEB-0818399 of the National Science Foundation to FAM. Walter Judd and an anonymous reviewer provided many comments that greatly improved this manuscript.

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