

JAMAICANTHUS, A NEW ENDEMIC GENUS OF JAMAICA (RONDELETIEAE, RUBIACEAE) AND RONDELETIA – A MODEL FOR THE GAARLANDIA THEORY

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Jamaicanthus, a new monotypic endemic genus of the tribe Rondeletieae (Rubiaceae) in the flora of Jamaica is described based on *Rondeletia laurifolia* Sw. It is interpreted as a new important argument supporting the Gaarlandia theory.

Key words: Gaarlandia, Jamaica, new genus, *Rondeletia*, Rubiaceae

INTRODUCTION

The wide concept interpretation of the genus *Rondeletia* published by Standley (1918) and followed by Standley and Williams (1975), Dwyer (1980a, b), Lorence (1991, 1999), Burger and Taylor (1993) turned to be a treasury of the unrecognised and/or misunderstood genera during a recognising taxonomic process of the last fifty years.

The first step was made by Steyermark in his study of basic importance (1967) when resurrected the genera *Arachnothryx* and *Rogiera* both described by Planchon in 1849 and subdivided by Standley into three subgeneric groups (not named as sections) under the names *Amoenae* (*Rogiera*), *Laniflorae* and *Leucophyllae* (*Arachnothryx*). The next steps were made by Borhidi and his co-authors as results of their critical revisions carried out on the Rubiaceae family in the frame of the new Flora of Cuba project. They recognised the monotypic *Tinifoliae* group of Standley as *Acunaeanthus* Borhidi, J.-Komlódi et Moncada (1981), the monotypic *Correifoliae* group of Standley as *Roigella* Borhidi et Fernández-Zequeira (1981) and described the Cuban-Hispaniolan *Suberanthus* Borhidi et Fernández (1982) based on 5 species of the group *Stellatae* of Standley. The monotypic *Hondurenses* group of Standley has been separated as a new endemic genus under the name *Javorkaea* Borhidi et J. Komlódi (1983).

A highly important moment of this process was the confirmation of the above listed new genera by the molecular phylogenetic studies of Rova (1999a, b) and Rova *et al.* (1999a, 2002). The critical comparative taxonomic studies of the Mexican *Rondeletia*-like species led to the recognition and description of further two new genera by Borhidi *et al.* (2004). Two species of the heterogenic

Calycosae group of Standley turned to have a number of distinctive characters both in morphological and sexual aspects for their separation into the new genus *Renistipula* Borhidi (in Borhidi *et al.* 2004). A more detailed and sophisticated morphological-anatomical study of the earlier separated *Rogiera* encouraged and supported by the mentioned molecular studies of Rova (1999a, b) and Rova *et al.* (1999, 2002) resulted the correct separation and description of the genus *Rovaeanthus* Borhidi (op. cit. 2004) dedicated to Johan Rova recognising his merits in this discovery.

Sometimes the molecular phylogenetic studies claimed the attention of the specialists to the existence of species being in hiding and unrecognised as members of undescribed genera, which needed more new morphological, anatomical, often submicroscopic studies for their validation. This happened in the case of the mentioned *Rovaeanthus*, and later a similar activity led to the description of *Donnellyanthus* Borhidi (2011) based on *Bouvardia deamii* Donn.-Smith, transferred by Standley into the genus *Rondeletia* as a member of his Calycosae group (1918). A recent result of this research process is the description of *Tainus* Torr.-Montúfar, H. Ochot. et Borsch. (2017) from the flora of Hispaniola based on *Rondeletia pitreana* Urb. et Ekm., and the fresh new one is the separation of the Cuban endemic *Ramonadoxa* Paudyal and Delprete (2018) in the Chiococceae tribe, based on *Chiococca cubensis* Urb.

And now, here is the separation of the fifth monotypic satellite genus, *Jamaicanthus* from Jamaica (see the description below), based on *Rondeletia laurifolia* Sw. classified by Standley (1918) as a member of his very diverse *Laurifoliae* group consisting of 18 species, including also the type species of the genus *Rondeletia*.

The molecular taxonomic studies modified also the circumscription of some tribes of the Cinchonoideae subfamily (Rova *et al.* 2009, Manns and Bremer 2010) and actually the genera of the former *Rondeletia*-complex have the following tribal positions:

Rondeletieae	Guettardeae	Hamelieae
<i>Acunaeanthus</i>	<i>Arachnothryx</i>	<i>Renistipula</i>
<i>Donnellyanthus</i>	<i>Javorkaea</i>	
<i>Jamaicanthus</i>	<i>Rogiera</i>	
<i>Roigella</i>		
<i>Rondeletia</i> s. str.		
<i>Rovaeanthus</i>		
<i>Suberanthus</i>		
<i>Tainus</i>		

It is to be noted that the results of the molecular phylogenetic studies are not accepted always and by every taxonomists, some of them occupying a so called "conservative standpoint". This kind of view is sometimes followed by the taxonomic checklists, which are considered as competent authorities.

DISCUSSION

Jamaicanthus Borhidi, genus novum Rubiacearum, sectio: Rondeletieae

Typus generis: *Rondeletia laurifolia* Sw., Flora Indiae Occidentalis 1: 363 (1797).

Frutex vel arbor parva usque ad 15 m alta truncus gracilis, rami crassi, cylindracei vel subcompressi, cinerascens-brunnei, longitrorse fissurati, hornotini dense et brevissime strigillosi, postremo glabrati, internodiis valde abbreviatis. Stipulae late deltoideae, 3 a 4 mm longae, acutae vel acuminatae, rigidaeque erectae, dorsaliter sparse strigillosae vel glabrae, ventraliter sericeae. Folia opposita, petiolis crassis, 0.7–2 cm longis, minute strigillosis vel glabratis suffulta, elliptica ad oval-elliptica, basi cuneata, apice acuta vel acuminata, saepe abrupte corto-acuminata, 8–15 cm longa et 2.5–6.5 cm lata, lamina chartacea vel coriacea, supra verde obscura et nitida, subtus glabra vel sparse pilosa et leviter pallidiora, nervibus strigillosis; nervo medio subtus crasse prominente, lateralibus utroque latere 6–8, gracilibus, sub angulo 45° vel maiore abeuntibus et arcuato-ascendentibus, margine plano. Inflorescentiae axillares, laxe cymoso-paniculatae, multiflorae, 6–15 cm longae, foliis plerumque aequilongae, 1.5–6 cm longe pedunculatae, ramulis strigillosis. Florae sessiles vel brevissime pedicellatae, bracteis rariter foliaceis, plerumque lanceolato-subulatis, bracteolis triangularibus minutis praeditae. Hypanthium 1–1.3 mm longum, depresso globosum, densissime et minute albo-strigillosum. Lobi calycis 5, triangular-deltoidei, 0.5 mm longi, erecti et plerumque glabri. Corolla alba, flavescens vel brunneo-flava, infundibuliformis, tubus obconicus, 1.5–2.5 mm longus, superne valde ampliatus, fauce apertus sine anello carnosio fauciali, extus dense albo-tomentosus, intus glaber; lobi 5, suborbiculares, 1.5 mm longi, plerumque tubo aequilongi, apice rotundati, horizontaliter patentes, supra tomentulosi. Discus ovarii supra dense piloso-tomentulosus. Stamina 5, medio tubi affixa, filamenta glabra, antheris aequilonga, antherae obovato-ellipticae, 0.4–0.5 mm longae, in typo brevistylo leviter exsertae; grana pollinica tricolporata, suboblato-sphaeroidalia, 8–12 µm longa et 8–11 µm lata, exine minute reticulata. Stylus 0.5–0.8 mm longus, glaber, stigma subcapitatum. Capsula loculicida, depresso globosa, 2–2.5 cm longa, semina applanata, elongata, bialata.

Shrub or tree up to 15 m high; the branches stout, terete or subcompressed, greyish brown, rimose, densely and minutely whitish strigillose, when young, but soon glabrate; the internodes very short. Stipules broadly deltoid, 3–4 mm long, acute or acuminate, rigid, erect, sparsely strigillose or

glabrous outside, sericeous within. Leaves opposite, the petioles stout, 0.7–2.0 cm long, minutely strigillose or glabrate, the blades elliptic to oval-elliptic, 8–15 cm long, 2.5–6.5 cm wide, obtuse or acute at the base, often abruptly short acuminate, acute or acuminate at the apex, chartaceous-coriaceous, dark green and lustrous above glabrous beneath slightly paler, strigillose along the veins, elsewhere glabrous or nearly so, veins plane or sulcate above, the costa stout, prominent beneath, the lateral veins slender, prominulous, 6–8 on each side, arcuate, ascending at an angle 45° or more, the margins plane. Inflorescence axillary, loosely cymose-paniculate, many-flowered, 6–15 cm long, the branches strigillose, the peduncles 1.5–6 cm long. Flowers sessile or very shortly pedicellate, bracts sometimes foliaceous, usually lance-subulate, the bractlets triangular minute. Hypanthium 1–1.3 mm long, subglobose, very densely and minutely whitish strigillose. Calyx lobes 5, minute, deltoid, shorter than the hypanthium, usually glabrate, erect. Corolla white, yellowish or brownish yellow, densely whitish tomentulose outside, the tube obconic, without a thickened faucial ring, 1.5–2.5 mm long, the 5 lobes rounded, nearly or quite as long as the tube, tomentulose within, spreading. Stamens 5, inserted in the middle of the corolla tube, filaments glabrous, anthers obovate-elliptic or ovoid-oblong, 0.4–0.5 mm long, as long as the filaments, in short styled type specimen slightly exerted. Ovary disc densely pilose-tomentulose above. Style 0.5–0.8 mm long, glabrous, stigma subcapitate. Capsule depressed globose, 2–2.5 cm long, loculicide. Seeds applanate, oblong, winged at both ends.

Jamaicanthus laurifolius (Sw.) Borhidi, *comb. nova, hoc loco*

Basionym: *Rondeletia laurifolia* Sw., *Flora Indiae Occidentalis* 1: 363 (1797). – Type: P. Browne: *Hist. Jam.* table 2. fig. 2. Specimens of Swartz in S! and BM!

The morphological differences between *Rondeletia* and *Jamaicanthus* listed below in Table 1 are certainly sufficient for the separation of the two genera. May arise the question, why have not been recognised all these diverse floral elements during two centuries, if they really exist. One of the possible motives is probably, the early description of *Rondeletia laurifolia* Sw. in 1797, when the morphological criteria of the genus *Rondeletia* was not clearly defined to permit its separation on generic level. The other one might have been its small sized flower.

The Andean origin of the Antillean flora

During the critical morphological study of the *Rondeletia* genus in the Caribbean carried out in the 80th years with Maira Fernández focusing espe-

Table 1
Morphological differences between the flowers of *Rondeletia* and *Jamaicanthus*

	<i>Rondeletia</i>	<i>Jamaicanthus</i>
Flower	salverform	funnelform
Corolla tube	cylindrical	obconical
outside	pilose to retrorse strigose	tomentulose
tube-lobes rate	2–6	1–1.5
thickened faucial ring	present	absent
ovary disc	hirsute-strigose	tomentose
style	hairy	naked
stigma	2-lobed	subglobose
pollen grain shape	oblate to prolate spheroidal	suboblate
pollen grain size	13–19 × 13–20 µm	8–11 × 8–12 µm
exine pattern	minutely to finely foveolate	minutely reticulate

cially to the admirable richness in diversity of this genus in Cuba, we arrived also to understand that the evolution centre of the genus is in the Greater Antilles with 145 species, all endemics. This extreme richness in endemics is probably the result of the early separation of the Greater Antilles in the Miocene Superior from the continent, also their individual separate evolutionary process during the Pleistocene (see: Borhidi 1996, Durham 1985, Gentry 1982) as it was explained based on a thorough phytogeographical analysis of the origin of the flora of Cuba, resp. Greater Antilles in the chapter “Es la flora de Las Antillas de origen andino? (Borhidi 1996: 806–818, Table 225). The analysis produced the following results.

In the flora of Cuba the flowering plants are represented with as much as 179 families; 48 of them are of Andean origin, which is 27% of the total, seemingly with a low share. But we have to take into consideration, that among these 48 families are found the most important 8 families of the flora: Asteraceae, Myrtaceae, Rubiaceae, Melastomataceae, Ericaceae, Gesneriaceae, Acantaceae and Solanaceae.

The Andean origin of the flora comes into a dominant position at generic level. The flora of Cuba contains 873 flowering plant genera, and 464 of them – the 53% – are of Andean origin. On specific level the participation rate of the plants of Andean origin is similarly high, 2,443 species of the total 5,900, resulting the 41% of the flora. It is highly remarkable, that 1,572 of the 2,443 species, namely 64% are endemic.

Based on these data Borhidi concluded to forward the necessity of the existence of an early to middle Tertiary land bridge connecting the Eastern An-

dean Ridges through the Aves Ridge with the Proto-Greater Antilles, pointing out a forecast of the later expounded Gaarlandia theory (Iturralde-Vinent and MacPhee 1999) with the following words:

"Basándonos en estas cifras podemos afirmar, que los elementos del centro andino juegan un papel igual de importante en la flora de las Antillas, que en la flora de América Central y México. Esto significa que la flora antillana es fundamentalmente de origen andino, consecuentemente los elementos de esta flora tenían que llegar a las Antillas a través de una cordillera andina, o varias cordilleras andinas. Es posible, pero no tenemos todavía las evidencias geológicas necesarias. Los geólogos tienen que encontrarlas, porque las evidencias botánicas y fitogeográficas presentan argumentos muy poderosos. No se puede olvidar que el concepto de la tectónica moderna ya fue prelegado mucho antes por la teoría de Wegener, basado principalmente en evidencias biogeográficas. Se puede esperar que los fenómenos biogeográficos – más temprano o más tarde – reciban su justificación geológica." (Borhidi 1996: 814.)

Rondeletia a model genus of the Gaarlandia theory

For a better understanding of the Andean origin of the Antillean flora and its migration route exposed in the Gaarlandia theory is useful to find comprehensive taxonomic units regarding them as models of this process. Our proposal is to regard the genus *Rondeletia* L. of the tribe Rondeletieae in the family Rubiaceae as a highly appropriate taxon for this purpose. *Rondeletia* contains 165 species; 15 of them live in the northern part of the South American continent, all of them belong to the older types of the genus characterized by 5-parted flowers and many-flowered cymose-corymbose to cymose-paniculate inflorescences. Presumably, during the Early to Middle Tertiary arrived the first representatives of the genus to the Proto-Greater Antillean island composed by South-Hispaniola, Southeast Cuba and also with a relation to the Northeastern part of Jamaica through the land bridge of the Aves Ridge (Iturralde-Vinent and Cahagan 2016). Arriving the first settlers of *Rondeletia* found an extremely rich variation of the diverse eco-topes, and this wide choice of biotopes – even multiplied by the Quaternary uplift of the separated islands – forced a campaign of adaption and producing an explosion of the new forms. A process like this may explain that the *Rondeletia* genus produced 145 species in the West Indies, all endemics and developed the two most evolved sections of the genus, the *Chamaebuxifoliae* and the *Hypoleucae* sections, characterised by few (1–3)-flowered inflorescences and 4-parted flowers. These two sections give the 38 % of the 145 West Indian endemic *Rondeletias*, i.e. 55 species, consisting of 41 Cuban, 10 Hispaniolan and 4 Puerto Rican and Lesser Antillean endemics. The separation of the 5 satellite endemic genera – 4 of them monotypic ones – of the Greater Antilles listed above in the

introductory chapter, namely *Acunaeanthus*, *Roigella*, *Suberanthus*, *Tainus*, and now the new *Jamaicanthus* may be considered as further arguments supporting the validity of the Gaarlandia hypothesis.

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