

AN UNCOMMON PYRENE TYPE AND TWO NEW GENERA IN THE NEOTROPICAL PSYCHOTRIEAE (RUBIACEAE)

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A new pyrene type is reported, it is morphologically different from that found in the genera *Palicourea* and *Psychotria*. This new type is characterised by being triangulate in transverse section with an elevated central-dorsal crest. It was observed in two species of *Palicourea* with dissimilar floral characteristics. Based on this finding, we propose to transfer *Palicourea tetragona* (Donn.-Sm.) C. M. Taylor et Lorence to *Mexocarpus* gen. nov., and *Palicourea seemannii* Standl. to *Ditrichanthus* gen. nov.

Resumen. Se ha detectado un nuevo tipo de pireno morfológicamente distinto de los ampliamente conocidos en los géneros *Palicourea* y *Psychotria*. El nuevo tipo se caracteriza por presentar sección transversal triangular y una cresta dorsal-central muy prominente; contrastando con la sección transversal semicircular, dorsalmente lisa o inconspicuamente 3–5 costulada de los géneros ya mencionados. Este tipo de pireno se observó en dos especies de *Palicourea* con características florales diferentes entre sí. Con base en estos hallazgos se proponen dos géneros nuevos: *Mexocarpus* basado en *Palicourea tetragona* (Donn.-Sm.) C. M. Taylor et Lorence y *Ditrichanthus* apoyado en *Palicourea seemannii* Standl.

Key words: *Ditrichanthus*, fruit morphology, Latin America, *Mexocarpus*, Rubiaceae

INTRODUCTION

Robbrecht emphasised in several papers the high diagnostic value of pyrene characters in the Rubiaceae particularly in the tribe Psychotrieae (Robbrecht 1975, 1988, 1989a, b). He referred to prior studies of the basic importance of fruit characteristics, which turned out to be very useful in the classification of the African Psychotrieae. Petit (1964) observed a wide array of morphological variation in fruit and seeds; the pyrenes proved to be extremely variable in size, shape, occurrence of appendages, etc., and the performed germina-

tion slits (PGSs) on the ventral surface of the pyrenes. He found good correlations between the variation of PGSs (number, position, length, etc.) and other characters. He concluded that PGS characters have a high diagnostic value, particularly at the generic level, and summarised his observations in a key to the African genera of Psychotriaceae and related tribes. According to this key (Petit 1963, Robbrecht 1989a), African *Psychotria* species are characterised by absence of germination slits; in contrast, neotropical *Palicourea* and *Psychotria* s. l. species do have a ventral longitudinal germination slit (Taylor 2012a, b).

THE NEW PYRENE TYPE

Morphological characters of fruit and pyrenes are rather uniform among the approximately 200 species of the genus *Palicourea* and 800 neotropical species of *Psychotria*. Fruits are drupaceous, globose, subglobose, elliptical or ovoid-oblong, with fleshy to juicy mesocarp; each usually contains 2 pyrenes (5 in a few species), 1-locular, plane convex, always hemispherical with semi-orbicular cross section (obtriangular when 5), generally with 3–5 obtuse or acute longitudinal ribs on the dorsal surface, and a longitudinal central ventral slit on the inner plane, or slightly concave surface. However, these combination of characters have been studied and verified by de first author in fruits of 323 neotropical *Palicourea* and *Psychotria* species (Table 1). During the process with careful observation a particularly different pyrene type was found in two species: *Palicourea tetragona* (Donn.-Sm.) C. M. Taylor et Lorence and *P. seemannii* Standl. One of them *Palicourea tetragona* was originally described in the genus *Cephaëlis*, later transferred to *Psychotria* and recently to *Palicourea*. The fruits are drupaceous, globose, subglobose or obovate, slightly to explic-



Fig. 1. The common form of pyrenes in the *Palicourea* and *Psychotria* genera. Example: pyrenes of *Palicourea calophylla* (Stevens et al. 25581, MEXU) (photo: A. Borhidi)

Table 1

Morphological characters of fruit and pyrenes in neotropical *Palicourea* and *Psychotria* species

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
Mesoamerican <i>Palicourea</i> species				
<i>P. acetosoides</i> Wernh.	3.5–4.5 × 3.5–4.5	elliptical-subglobose	4–5 rounded	hsf
<i>P. adusta</i> Standl.	3.5–4.5 × 3.5–4.5	elliptical-obovate	4–5 rounded	hsf
<i>P. alajuelensis</i> C. M. Taylor	10–12	subglobose	smooth or 3–4 weak	hsf
<i>P. albocaerulea</i> C. M. Taylor	5–6 × 5–6	ovoidal	3–5 rounded	hsf
<i>P. angustifolia</i> Kunth in HBK.	4–6 × 4–6		3–5 rounded	hsf
<i>P. beachiana</i> C. M. Taylor	9 × 10	elliptical	3–4 acute	hsf
<i>P. bella</i> (Standl.) Dwyer	6 × 6	elliptical	3–4 acute	hsf
<i>P. bellula</i> C. M. Taylor	5 × 5	subglobose	3–5 acute	hsf
<i>P. breedlovei</i> (Lorence) Lorence	6–8 (diam.)		3–5 obtuse, weak	hsf
<i>P. brenesii</i> Standl.	4–6 × 4–6	subglobose	3–5 rounded	hsf
<i>P. calidicola</i> (Taylor) Taylor	15–20 × 12–20	obovate-elliptical	4–5 obtuse, weak	hsf
<i>P. chiriquina</i> Standl.	3.5–5 × 3.5–4	obovate	3–5 rounded	hsf
<i>P. chrysocalymma</i> (L. O. Wms.) Taylor	5 (diam.)		3–4 obtuse, weak	hsf
<i>P. crocea</i> (Sw.) Roem. et Schult.	4–6 × 4–6	obovate-globose	3–5 rounded	hsf
<i>P. dimorphandroides</i> (Dwyer) Taylor	5 × 4	elliptical-ovate	3–5 acute	hsf
<i>P. discolor</i> K. Krause	4–5 × 4–5	subglobose	3–5 rounded	hsf
<i>P. domingensis</i> (Jacq.) DC.	4–7 × 6–8	oval-elliptical	4–5 acute	hsf
<i>P. eurycarpa</i> (Standl.) Taylor	8–12 (diam.)	elliptical-obovate	4–5 obtuse	hsf
<i>P. garciae</i> Standl.	5 × 5	elliptical	3–5 rounded	hsf
<i>P. gardenioides</i> (Scheidw.) Hemsl.	5.5–6 × 6	elliptical	4–5 acute	hsf
<i>P. gomezii</i> C. M. Taylor	6 × 6	obovate	3–5 acute	hsf
<i>P. grandifructa</i> (Taylor) Taylor	15 (diam.)	elliptical	smooth or 4–5 weak	hsf
<i>P. guianensis</i> Aubl.	5–7 × 3.5–5	ovate-elliptical	3–5 rounded	hsf
<i>P. hammelii</i> C. M. Taylor	8–10 × 7–8	elliptical	3–4 acute	hsf
<i>P. heydei</i> (Standl.) Lorence	7 × 6	elliptical	4–5 acute	hsf
<i>P. hondensis</i> (Standl.) Taylor	15–17 (diam.)	subglobose-elliptical	smooth to angulate	hsf
<i>P. ianthina</i> C. M. Taylor	7 × 4	obovate-elliptical	3–5 rounded	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. lancifera</i> Standl. et L. O. Wms.	4–5 × 4–5	ovate-subglobose	4–5 rounded	hsf
<i>P. lasiorrhachis</i> Oerst.	4–5 × 3–5	obovate	4–5 rounded	hsf
<i>P. leucantha</i> Donn.-Sm.	4–6 × 3–5	elliptical	4–5 rounded	hsf
<i>P. macrantha</i> Loes.	5 × 4–4.5	elliptical-ovate	3–5 rounded	hsf
<i>P. macrocalyx</i> Standl.	5–6 × 4–5	elliptical-subglobose	4–5 rounded	hsf
<i>P. mediocris</i> (Standl. et Steyerl.) Lorence	10 (diam.)	subglobose	smooth	hsf
<i>P. montivaga</i> Standl.	4–5 × 3–4	elliptical-obovate	4–5 rounded	hsf
<i>P. nebulosa</i> (Dwyer) Taylor	10–12 × 10–12	elliptical	4–5 acute	hsf
<i>P. neopurpurea</i> C. M. Taylor	7 × 6	elliptical-ovate	4–5 acute	hsf
<i>P. ochnoides</i> Dwyer	5–7 × 5–7	elliptical-subglobose	4–5 acute	hsf
<i>P. orosiana</i> C. M. Taylor	5 × 5	obovate	4–5 rounded	hsf
<i>P. padifolia</i> (Willd. ex Roem. et Schult.) C. M. Taylor et Lorence	4–6(10) × 3–6(10)	ovate-elliptical	4–5 rounded	hsf
<i>P. palustris</i> A. C. Gilman et Taylor	5 × 5	elliptical	3–4 broadly angulate	hsf
<i>P. pauciflora</i> Standl.	7 × 6–7	elliptical-ovate	4–5 acute	hsf
<i>P. pendula</i> C. M. Taylor	6–7 × 4–4.5	obovate	4–5 rounded	hsf
<i>P. pereziana</i> C. M. Taylor	8–10 × 8–10	elliptical-obovate	3–5 broadly angulate	hsf
<i>P. providenciana</i> Sanchez-Gonz. et Taylor	4–6 × 4–5	obovate-elliptical	3–4 rounded	hsf
<i>P. psychotrioides</i> (Taylor et Hammel) Taylor	15–20 × 12–16	elliptical	smooth or 4–5 weak	hsf
<i>P. purpurea</i> C. M. Taylor	4–5 × 5–6	subglobose	4–5 rounded	hsf
<i>P. pyramidalis</i> Standl.	5–6 × 5–6	obovate	4–5 rounded	hsf
<i>P. rigidifolia</i> (Dwyer et Hayden) Dwyer	5–7 × 5–10	subglobose-elliptical	smooth	hsf
<i>P. roseocrema</i> (Dwyer) C. M. Taylor	9 × 10	elliptical	4–5 acute	hsf
<i>P. roseofaucis</i> C. M. Taylor	5 × 5.5	elliptical-obovate	3–4 broadly angulate	hsf
<i>P. salicifolia</i> Standl.	6–7 × 6–7	elliptical	3–4 broadly angulate	hsf
<i>P. skotaki</i> C. M. Taylor	6–7 × 5	elliptical-obovate	4–5 acute	hsf
<i>P. spathacea</i> C. M. Taylor	6–8 × 6–8	elliptical-subglobose	3–5 acute	hsf
<i>P. standleyana</i> C. M. Taylor	8 × 5	elliptical	3–5 rounded	hsf
<i>P. thornei</i> (Lorence) Lorence	7–8 × 4–5	elliptical	4 rounded	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. tilaranensis</i> C. M. Taylor	4–5 × 3.4	elliptical	4–5 rounded	hsf
<i>P. triphylla</i> DC.	3.5–5 × 3.5–4	ovate	3–5 rounded	hsf
<i>P. tubuliflora</i> Dwyer	8–10 × 6–8	elliptical-subglobose	smooth	hsf
<i>P. umbelliformis</i> (Dwyer et Hayden) Taylor	15 × 12	elliptical	4–5 acute	hsf
<i>P. vestita</i> Standl.	6 × 6	obovate	4–5 rounded	hsf
Mexican and Mesoamerican <i>Heteropsychotria</i> species				
<i>H. acicularis</i> C. M. Taylor	4 (diam.)	elliptical-didymous	3–5 obtuse	hsf
<i>H. acuminata</i> Benth.	3–5 × 5–6	subglobose	smooth	hsf
<i>H. allenii</i> Standl.	14–15 (diam.)	elliptical	smooth	hsf
<i>H. angustiflora</i> K. Krause	5–7 (diam.)	elliptical-ovate	4–5 acute	hsf
<i>H. aubletiana</i> Steyerem.	3–8 × 2–5	elliptical-ovate	3–4 obtuse	hsf
<i>H. aurantibractea</i> C. M. Taylor	5 × 4.5	subglobose	3–4 acute	hsf
<i>H. berteroana</i> DC.	3.5–5	elliptical-didymous	4–5 weak	hsf
<i>H. boraginoides</i> (Dwyer) Taylor	5 × 7	elliptical-obovate	smooth	hsf
<i>H. brachiata</i> Sw.	4–5 × 3.5	subglobose	3–5 acute	hsf
<i>H. buchtienii</i> (H. J. P. Winkl.) Standl.	4.5–5 (diam.)	elliptical-subglobose	4–5 acute	hsf
<i>H. caerulea</i> Ruiz et Pav.	5 × 4	subglobose-elliptical	4–5 obtuse	hsf
<i>H. capitata</i> Ruiz et Pav.	5–7 (diam.)	elliptical	3–5 acute	hsf
<i>H. carnosocarpa</i> Dwyer et Hayden	4–5 × 5.5–6	elliptical-obovate	smooth	hsf
<i>H. chiriquiensis</i> (Standl.) Taylor	5 × 4	elliptical	smooth	hsf
<i>H. chlorobotrya</i> Standl.	4–5 (diam.)	obovate	4–5 acute	hsf
<i>H. cooperi</i> Standl.	5 × 3.5	elliptical-obovate	3–5 acute	hsf
<i>H. correae</i> (Dwyer et Hayden) Taylor	10–15 × 5–6	elliptical	3–4 weak	hsf
<i>H. croatii</i> (Dwyer) Taylor	4 × 3.5	subglobose	4–5 obtuse	hsf
<i>H. croceovenosa</i> Dwyer	3.5–4 (diam.)	elliptical	4–5 acute	hsf
<i>H. cyanococca</i> Seem. et Dombrain	3–4 × 2.5–3.5	subglobose-elliptical	4–5 rounded	hsf
<i>H. deflexa</i> DC.	2.5–3.5 (diam.)	obovate	4–5 obtuse	hsf
<i>H. dichroa</i> (Standl.) C. M. Taylor	8 × 5.5	elliptical	3–4 rounded	hsf
<i>H. elata</i> (Sw.) Hammel	5–10 × 2–5	elliptical	3–4 rounded	apl
<i>H. gaitalensis</i> C. M. Taylor	3 × 2.5	elliptical	4–5 acute	hsf
<i>H. galeottiana</i> (M. Martens) Taylor et Lorence	3–4 × 3–4	elliptical	4–5 rounded	hsf
<i>H. glomerulata</i> (Donn.-Sm.) Steyerem.		elliptical	smooth	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>H. goldmanii</i> Standl.	3.5–4 × 3–3.5	elliptical	3–4 obtuse	hsf
<i>H. gracilentia</i> Müll.-Arg.	3–4 × 3–4	oblanceolate	3–4 obtuse	hsf
<i>H. guapilensis</i> (Standl.) Hammel	8–10 × 6–8	elliptical	smooth	hsf
<i>H. hazenii</i> Standl.	4 × 3.5–4	elliptical	3–4 obtuse	hsf
<i>H. hebeclada</i> DC.	3–5 × 3–5	elliptical-subglobose	3–5 obtuse	hsf
<i>H. hispidula</i> Standl. et Steyerem.	4.5–5 × 4.5	elliptical-subglobose	4–5 rounded	hsf
<i>H. hoffmannseggiana</i> (Willd. ex Roem. et Schult.) Müll.-Arg.	4.5 (diam.)	elliptical	4–5 rounded	hsf
<i>H. juarezana</i> C. M. Taylor et Lorence	5 × 4.5	subglobose	4–5 rounded	hsf
<i>H. longicuspis</i> Müll.-Arg.	4.5–5 (diam.)	subglobose	smooth	hsf
<i>H. longirostris</i> (Rusby) Standl.	4–5 (diam.)	elliptical-obovate	3–4 acute	hsf
<i>H. lozadae</i> Borhidi et Lorea-Hernandez	4–5 (diam.)	elliptical-obovate	3–5 acute	hsf
<i>H. luxurians</i> Rusby	2.5–3 (diam.)	subglobose	4–5 obtuse	hsf
<i>H. microbotrys</i> Ruiz ex Standl.	3–4.5 (diam.)	elliptical	3–4 obtuse	hsf
<i>H. minarum</i> Standl. et Steyerem.	4.5–5 × 4.5	ovate	4–5 rounded	hsf
<i>H. molinarum</i> Lorence	5 × 5	elliptical	3–4 rounded	hsf
<i>H. mortoniana</i> Standl.	2.5–3 (diam.)	elliptical-ovate	4–5 acute	hsf
<i>H. muscosa</i> (Jacq.) Steyerem.	5 × 4.5	elliptical	3–4 rounded	hsf
<i>H. oreodoxa</i> L. O. Wms.	2.5 (diam.)	elliptical	3–4 obtuse	hsf
<i>H. osaensis</i> C. M. Taylor	2 × 3	subglobose	4–5 obtuse	hsf
<i>H. paniculata</i> (Aubl.) Raeusch.	4 (diam.)	obovate	4–5 obtuse	scr
<i>H. paradichroa</i> C. M. Taylor	7 × 4	ovate-elliptical	3–4 rounded	hsf
<i>H. perotensis</i> Cast.-Campos	4–7 (diam.)	subglobose-didymous	3–5 obtuse	
<i>H. phanaerandra</i> (Standl. et Steyerem.) Lorence	5–7 × 5–6.5	elliptical	3–5 rounded	hsf
<i>H. pilosa</i> Ruiz et Pav.	3–8 × 3–6	elliptical	3–4 acute	hsf
<i>H. platypoda</i> DC.	5 × 5	elliptical-cylindrous	smooth	hsf
<i>H. poeppigiana</i> Müll.-Arg.	9–15 × 3–10	elliptical	3–5 rounded	hsf
<i>H. pubescens</i> Sw.	3–5 × 3–5	subglobose	4–5 obtuse	hsf
<i>H. racemosa</i> Rich.	4–7 (diam.)		3 rounded	3-ang
<i>H. recordiana</i> Standl.	4–4.5 (diam.)	elliptical	3–4 obtuse, weak	hsf
<i>H. sanblasensis</i> C. M. Taylor	4 × 5	elliptical	3–4 obtuse	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>H. sanctae-rosae</i> Standl.	5 × 4	subglobose	3–4 weak	hsf
<i>H. schunkei</i> C. M. Taylor	7 (diam.)	elliptical-ovate	3–4 rounded	hsf
<i>H. siccorubra</i> Dwyer	4–5 × 4–5	ovate-subglobose-elliptical	3–4 rounded	hsf
<i>H. simiarum</i> Standl.	6–8 × 6–7	subglobose-obovate	smooth	hsf
<i>H. solitudinum</i> Standl.	5 (diam.)	elliptical	4–5 acute to obtuse	hsf
<i>H. steyermarkii</i> Standl.	5 × 4.5–5	obovate	3–5 obtuse	hsf
<i>H. suerrensis</i> Donn.-Sm.	4–5 (diam.)	ovate	3–5 obtuse	hsf
<i>H. tacarcunensis</i> Dwyer	4 × 5–5.5	subglobose	4–5 obtuse	hsf
<i>H. tapantiensis</i> C. M. Taylor	3.5–4 (diam.)	elliptical-obovate	4–5 acute	hsf
<i>H. torresiana</i> Standl.	3–4 (diam.)	subglobose-obovate	4–5 acute	hsf
<i>H. tsakiana</i> C. M. Taylor	5 (diam.)	subglobose-oblate	2–3 rounded	3-ang
<i>H. valerioana</i> Standl.	5 × 7	subglobose	smooth	hsf
<i>H. veracruzensis</i> Lorence et Dwyer	4–6 (diam.)	subglobose	3–4 weak	hsf
Mexican and Mesoamerican <i>Psychotria</i> species				
<i>P. aguilarii</i> Standl. et Steyererm.	5–6 × 3–4	ellipsoidal	smooth	hsf
<i>P. alfaroana</i> Standl.	8–12 × 4–6	ellipsoidal-obovate	4–5 acute to rounded	hsf
<i>P. bakeri</i> Dwyer	4 × 4	subglobose	4–5 rounded	hsf
<i>P. calophylla</i> Standl.	10–14 × 6–9	ellipsoidal	4–5 rounded	hsf
<i>P. chagrensis</i> Standl.	5–8 × 3–6	ellipsoid-ovoidal	4–5 rounded	hsf
<i>P. chamelaensis</i> C. M. Taylor et Doming.-Licona	4–5 × 4–4.5	ellipsoidal	4–5 obtuse	hsf
<i>P. chiriquiana</i> Standl.	5–6 × 4–4.5	ellipsoidal	4–5 acute	hsf
<i>P. chitariana</i> Dwyer et C. W. Hamilt.	6–7 × 4	ellipsoidal	4–5 acute	hsf
<i>P. clivoorum</i> Standl. et Steyererm.	5–6 × 4–4.5	ellipsoidal	4–5 acute	hsf
<i>P. cocosensis</i> C. W. Hamilt.	6 × 5.5–6	subglobose-ellipsoidal	4 rounded	hsf
<i>P. convergens</i> C. M. Taylor	6–7 × 5–6	ellipsoidal	4–5 rounded	hsf
<i>P. costivenia</i> Griseb.	5–8.5 × 4–7	ellipsoidal-subglobose	4–5 rounded	hsf
<i>P. dressleri</i> (Dwyer) C. W. Hamilt.	8–9 × 3.5–4.5	ellipsoidal	3–5 rounded	hsf
<i>P. durilancifolia</i> Dwyer	7–8 × 7	subglobose	4–5 rounded	hsf
<i>P. dwyeri</i> C. M. Hamilt.	4.5–5 (diam.)	globose	4–5 acute	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. erythrocarpa</i> Schlttdl.	4.5–6 × 3–4.5	ellipsoidal-subglobose	3–5 rounded	hsf
<i>P. fendleri</i> Standl.	4–4.5 × 3–4	ellipsoidal-subglobose	4–5 rounded	hsf
<i>P. flava</i> Oerst. ex Standl.	8–13 × 6–9	ellipsoidal	4–5 rounded	hsf
<i>P. fosteri</i> C. W. Hamilt.	5–7 × 2.5–4	ellipsoidal-sublan-ceolate	5 rounded	hsf
<i>P. fruticetorum</i> Standl.	4–5 × 3–3.5	ellipsoidal	3–5 rounded	hsf
<i>P. graciliflora</i> Benth. in Oerst.	4–6 × 3–5	ellipsoidal-subglobose	3–5 rounded	hsf
<i>P. hamiltoniana</i> C. M. Taylor	5 × 3.5	ellipsoidal	3–5 rounded	hsf
<i>P. hammelii</i> Dwyer	5–7 × 3.5–4	ellipsoidal	4–5 acute	hsf
<i>P. hidalgensis</i> Borhidi	5–6 × 4.5–5	elliptical-subglobose	3–5 rounded	hsf
<i>P. horizontalis</i> Sw.	3.5–5 × 2.5–5	ellipsoidal	3–5 rounded	hsf
<i>P. insueta</i> (Dwyer) Dwyer et C. W. Hamilt.	7–10 × 4.5	ellipsoidal	ca 5 rounded	hsf
<i>P. jefensis</i> Dwyer ex C. M. Taylor	4 × 4–4.5	subglobose	4–5 rounded	hsf
<i>P. jimenezii</i> Standl.	3.5–6 × 3.5–4.5	elliptical-obovate	3–4 rounded	hsf
<i>P. jinotegensis</i> C. Nelson, Molina et Standl.	5–6.5 × 4–5	ellipsoidal	4–5 rounded	hsf
<i>P. lamariensis</i> C. W. Hamilt.	7–8 × 4–5	ellipsoidal	4–5 rounded	hsf
<i>P. laselvensis</i> C. W. Hamilt.	4–5 × 4–5	subglobose	3–5 rounded	hsf
<i>P. liesneri</i> Dwyer	4–5 × 4–5	subglobose	4–6 rounded	hsf
<i>P. limonensis</i> K. Krause	3.5–4.5 × 3–4	ellipsoidal	4–5 rounded	hsf
<i>P. lorenciana</i> C. M. Taylor	4–5 (diam.)	subglobose	4–5 obtuse	hsf
<i>P. lundellii</i> Standl.	4–5.5 × 4–5.5	subglobose	smooth to 3–5 plane	hsf
<i>P. matagalpensis</i> C. M. Taylor	6–7 × 4.5–5	ellipsoidal-obovoid	4–5 rounded	hsf
<i>P. mexiae</i> Standl.	4.5–6 × 3.5–5	subglobose	4–5 rounded	hsf
<i>P. mirandae</i> C. W. Hamilt.	5–7 × 4–5	ellipsoidal	5 rounded	hsf
<i>P. molinae</i> Standl.	5 × 5–6	ellipsoidal	5 obtuse	hsf
<i>P. monsalvae</i> C. M. Taylor	3.5–4 (diam.)	subglobose	5 obtuse	hsf
<i>P. monteverdensis</i> Dwyer et C. W. Hamilt.	8–11 × 6–12	ellipsoidal	4–5 rounded	hsf
<i>P. neilii</i> C. W. Hamilt. et Dwyer	5–7 × 3–3.5	ellipsoidal-obovoid	3–4 rounded	hsf
<i>P. nubiphila</i> Dwyer	7–8 × 6–7	ellipsoidal	4–5 rounded	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. oaxacensis</i> Borhidi et Salas-Morales	5 (diam.)	globose	4 acute	hsf
<i>P. olgae</i> Dwyer et Hayden	9–12 × 5.5–8	ellipsoidal-obovoid	3–4 rounded	hsf
<i>P. orosiana</i> Standl.	4.5–6 × 3.5–5	ellipsoidal	4–5 rounded	hsf
<i>P. orosoides</i> C. M. Taylor	4–5 × 4–5	ellipsoidal-subglobose	4–5 rounded	hsf
<i>P. pacorensis</i> C. W. Hamilt.	5.5–7 × 3.5–5	ellipsoidal	4–5 rounded	hsf
<i>P. panamensis</i> Standl.	4.5–8 × 3.5–7	ellipsoidal-obovoid	4–5 rounded	hsf
<i>P. papantlensis</i> (Oerst.) Standl.	6–7.5 × 4–5	ellipsoidal	4 rounded	hsf
<i>P. parvifolia</i> Benth. in Oerst.	4–5 × 4–5	subglobose	3–5 rounded	hsf
<i>P. philacra</i> Dwyer	4.5–5.5 × 5–6	subglobose	4–5 acute	hsf
<i>P. pisonioides</i> Standl.	5–7 × 5–7	subglobose	3–5 rounded	hsf
<i>P. pleuropoda</i> Donn.-Sm.	5.5–6 × 4.5–5	ellipsoidal	4–5 rounded	hsf
<i>P. quinquerradiata</i> Pol.	5.5–9 × 4–6	ellipsoidal	4–5 rounded	hsf
<i>P. remota</i> Benth.	6–9 × 4–6	ellipsoidal	3–4 rounded	hsf
<i>P. rosulatifolia</i> Dwyer	5–6 × 4–4.5	ellipsoidal	5 rounded	hsf
<i>P. saltatrix</i> C. M. Taylor	6–6.5 × 4–4.5	obovoid	4–5 acute	hsf
<i>P. sarapiquiensis</i> Standl.	7–10 × 4–7	ellipsoidal-obovoid	4–5 acute	hsf
<i>P. sixaolensis</i> C. W. Hamilt.	7–9 × 5	ellipsoidal	4 acute	hsf
<i>P. tenuifolia</i> Sw.	4–5 × 3–5	subglobose	4–5 rounded	hsf
<i>P. turrubarensis</i> Burger et Q. Jiménez	7–10 × 6–9	ovoid	4–5 rounded	hsf
<i>P. viridis</i> Ruiz et Pav.	4–6 × 3–6	subglobose-ellipsoidal	4–5 rounded	hsf
South American <i>Psychotria</i> species				
<i>P. adderleyi</i> Steyerem.	2.5–4 × 3.5–4	subglobose	5 rounded	hsf
<i>P. adenophora</i> Steyerem.	5 × 3	ovoid-oblong	5 rounded	hsf
<i>P. amita</i> Standl.	4–5 × 4–5	subglobose-oblong	3–5 rounded	hsf
<i>P. anceps</i> HBK.	5–6 × 4.5–6	subglobose	5 obscure	hsf
<i>P. anisopoda</i> (Standl.) Steyerem.	8 × 4	ovoid-oblong	4 obtuse	hsf
<i>P. apoda</i> Steyerem.	12 × 15	subglobose		hsf
<i>P. aristeguietae</i> Steyerem.	7–12 × 6–10	subglobose-ovoid	3–5 rounded	hsf
<i>P. araguana</i> Standl.	3 × 4	subglobose	5 rounded	hsf
<i>P. aschersoniana</i> Schum. et K. Krause	4.5 × 2.5	ovoid-oblong	5 acute	hsf
<i>P. aubletiana</i> Steyerem.	4 × 2.5	ovoid-oblong	5 obtuse	hsf
<i>P. avilensis</i> Steyerem.	5 × 4	subglobose	5 obtuse	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. bahiensis</i> DC.	5 × 6	didymous	smooth	hsf
<i>P. blakei</i> Standl. et Steyerem.	4.5 × 4	subglobose	3 rounded	hsf
<i>P. blepharophora</i> (Standl.) Steyerem.	9 × 5	ovoid-oblong		hsf
<i>P. borjensis</i> HBK.	3.5–5 × 3	ovoid-elliptical	5 obtuse	hsf
<i>P. botryocephala</i> (Standl.) Steyerem.	5–6 × 3–4	ovoid-oblong	5 rounded	hsf
<i>P. bostrychothyrus</i> Sandw.	3.5 × 4.5–5	globose	5 rounded	hsf
<i>P. bracteocardia</i> (A. DC.) Müll.-Arg.	3–4 × 2–3	elliptical-ovoid	5 rounded	hsf
<i>P. calciphila</i> Steyerem.	6–7 × 4–6	subglobose-ovoid	5 acute	hsf
<i>P. campylopoda</i> Standl.	4–5 × 3	subglobose-obovoid	smooth	hsf
<i>P. cardiomorpha</i> C. M. Taylor et A. Pool	2–2.5 × 3	subglobose	3 obtuse	hsf
<i>P. carthagenensis</i> Jacq.	4.5–6.5 × 2.5–5	oblong	5 rounded	hsf
<i>P. celiae</i> Steyerem.	4.5–6 × 3.5–4.5	elipsoidal	4–5 rounded	hsf
<i>P. ceratantha</i> Standl.	5–6 × 6.5–10	subglobose	smooth	hsf
<i>P. colorata</i> (Willd. ex Roem. et Schult.) Müll.-Arg.	5–5.5 × 3–3.5	ovoid-oblong	5 obtuse	hsf
<i>P. concinna</i> Oliver	5 × 4	subglobose-ovoid	3–5 acute	hsf
<i>P. costularia</i> (Baill.) Standl. et Steyerem.	5 × 5	globose	3–5 acute	hsf
<i>P. coussareoides</i> Standl.	6–7 × 6–6.5	subglobose	2 obtuse	hsf
<i>P. crococlhamys</i> Sandw.	5–15 × 3.5–12	ovoid-subglobose	5 obtuse	hsf
<i>P. cuatrecasasii</i> Steyerem.	2–2.1 × 1–1.2	oblong-elliptical	5 obtuse	hsf
<i>P. cupularis</i> (Müll.-Arg.) Standl.	5–7 × 3.5–5	subglobose-ovoid	5 rounded	hsf
<i>P. duricoria</i> Standl. et Steyerem.	3–4 × 4	subglobose	5 rounded	hsf
<i>P. eciliata</i> Steyerem.	5–6 × 4	ovoid	5 obtuse	hsf
<i>P. eggersii</i> Standl.	4 × 4	globose	3 acute	hsf
<i>P. erecta</i> (Aubl.) Standl. et Steyerem.	8–10 × 4.5–8	ovoid-oblong	smooth	hsf
<i>P. everardii</i> Wernh.	5 × 5	subglobose	5 rounded	hsf
<i>P. fanshawei</i> (Standl.) Steyerem.	11–13 × 5–9	oblong-obovate	5 obtuse	hsf
<i>P. fortuita</i> Standl.	7 × 5–6	subglobose	3–4 obtuse	hsf
<i>P. franquevilleana</i> Müll.-Arg.	8 × 6	subglobose-ovoid	5 acute	hsf
<i>P. glandulicalyx</i> Steyerem.		subglobose-ovoid	3–5 rounded	hsf
<i>P. grandis</i> Sw.	5–6 × 5–6	globose	5 obtuse	hsf
<i>P. hemicephalis</i> Wernh.	5–8 × 5–8	subglobose	4–5 rounded	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. heteroneura</i> Steyerem.	6 × 6	subglobose	4 rounded	hsf
<i>P. hyalina</i> Steyerem.	7 × 4	ovoid	5 rounded	hsf
<i>P. imthurniana</i> Oliver	3.5 × 3.5	subglobose	4 rounded	hsf
<i>P. iodotricha</i> Müll.-Arg.	12–13 × 12–15	ovoid-subglobose	4 rounded	hsf
<i>P. irwinii</i> Steyerem.	6–7.5 × 5–7	ovoid-oblong	5 obtuse	hsf
<i>P. jauensis</i> Steyerem.	4 × 7	subglobose-ovoid		hsf
<i>P. leiantha</i> Steyerem.	5.5 × 4	globose-ovoid	4 rounded	hsf
<i>P. lindenii</i> Standl.	3 × 4	subglobose	4 obtuse	hsf
<i>P. lupulina</i> Benth. in Hook.	5 × 4	globose	smooth	hsf
<i>P. maguireorum</i> Steyerem.	4 × 4	ovoid-subglobose	5 acute	hsf
<i>P. mapourioides</i> DC.	5–7.5 × 4–5	subglobose-ovoid	5 obtuse	hsf
<i>P. marginata</i> Sw.	44 × 3–3.5	subglobose	5 rounded	hsf
<i>P. maturacensis</i> Steyerem.	13 × 10	ovoid-oblong	5 acute	hsf
<i>P. medusula</i> Müll.-Arg.	10 × 0	globose		hsf
<i>P. meridensis</i> Steyerem.	4–4.5 × 2.5–3	ovoid-oblong	5 acute	hsf
<i>P. micrantha</i> HBK.	5–5.5 × 3–3.5	ovoid-oblong	5 rounded	hsf
<i>P. microbotrys</i> Ruiz ex Standl.	33–3.5 × 3–4	subglobose	5 acute	hsf
<i>P. muscosa</i> (Jacq.) Steyerem.	4–7 × 4–7	ellipsoid-subglobose	4–5 rounded	hsf
<i>P. nervosa</i> Sw.	5–7 × 3–4.5	ovoid-oblong	5 rounded	hsf
<i>P. oblita</i> Wernh.	6–8 × 3–4	ellipsoidal	4–5 acute	hsf
<i>P. officinalis</i> (Aubl.) Sandw.	3 × 3–5	globose-obovoid		hsf
<i>P. pariensis</i> Steyerem.	5 × 5	subglobose	5 obtuse	hsf
<i>P. parvibractea</i> Steyerem.	4 × 3	subglobose-ovoid	3–5 acute	hsf
<i>P. phaneroloma</i> Standl. et Steyerem.	2 × 2.8	subglobose		hsf
<i>P. platypoda</i> A. DC.	2–4 × 3.5–4	subglobose	5 obtuse	hsf
<i>P. polycephala</i> Benth. in Hook.	2 × 2.5–3.5	subglobose	3–5 verruculose	hsf
<i>P. prunifolia</i> (HBK.) Steyerem.	5–7 × 3–4	ovoid-oblong		hsf
<i>P. psychotriifolia</i> (Seem.) Standl.	8–9 × 4–6	oblong	5 obtuse	hsf
<i>P. racemosa</i> (Aubl.) Rausch.	3.5–4 × 5–6	subglobose	5 obtuse	3-ang
<i>P. remota</i> Benth. in Hook.	5–6 × 3–4	ellipsoidal	4–5 rounded	hsf
<i>P. rosacea</i> Steyerem.	7 × 5	ellipsoidal	5 rounded	hsf
<i>P. rosea</i> (Benth.) Müll.-Arg.	5 × 4.5	subglobose-ovoid	5 rounded	hsf
<i>P. ruiz-terani</i> Steyerem.	6 × 6	globose	5 rounded	hsf
<i>P. santamartensis</i> Rusby	5–6.5 × 5–7			

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. schomburgkii</i> Benth. in Hook.	4–4.5 × 3	oblong-elliptical	3–5 rounded	hsf
<i>P. spadicea</i> (Pittier) Standl. et Steyerem.	3 × 3	subglobose-obovoid	5 obscure	hsf
<i>P. speluncae</i> Standl. et Steyerem.	6–8 × 6,5–7	subglobose	3–5 acute	hsf
<i>P. sphaerocephala</i> Müll.-Arg.	3–4 × 2.5–3	subglobose	5 obtuse	hsf
<i>P. stipulosa</i> Müll.-Arg.	5 × 4.5	ovoid-subglobose	3–5 acute	hsf
<i>P. subundulata</i> Benth. in Hook.	2 × 3	subglobose	5 obtuse	hsf
<i>P. tepuiensis</i> (Steyerem.) Steyerem.	8–15 × 10–13	subglobose	5 acute	hsf
<i>P. transiens</i> Wernh.	15 × 10	ovoid-subglobose	5 obtuse	hsf
<i>P. trichotoma</i> Mart. et Gal.	7–10 × 5–7	obovoid	5–7 rounded	hsf
<i>P. ulvoiformis</i> Steyerem.	4–9 × 4–7	subglobose	smooth	hsf
<i>P. variegata</i> Steyerem.	4–7 × 2–7	subglobose	smooth	hsf
<i>P. vasivensis</i> (Müll.-Arg.) Standl.	7–9 × 4.5–7	oblong-elliptical		
<i>P. vichadensis</i> Standl.	2 × 2	globose	3–5 rounded	hsf
<i>P. yaracuyensis</i> Steyerem.	6.5 × 5	subglobose	5 rounded	hsf
South American <i>Palicourea</i> species				
<i>P. acetosoides</i> Wernh.	4–5 × 3–3.5	ovoid	5 rounded	hsf
<i>P. angustifolia</i> Kunth in HBK.	3–4 × 4–5	subglobose	4–5 rounded	hsf
<i>P. apicata</i> in HBK.	5–8 × 5–7.5	subglobose	3–4 rounded	hsf
<i>P. aschersonioides</i> (Wernh.) Steyerem.	8 × 8	subglobose	5 rounded	hsf
<i>P. calophylla</i> DC.	6–7 × 5–6	subglobose	4–5 acute	hsf
<i>P. canaguensis</i> Steyerem.	10 × 7	ovoid	4–5 rounded	hsf
<i>P. corymbifera</i> (Müll.-Arg.) Standl.	3 × 4	subglobose	5 rounded	hsf
<i>P. ctenocalyx</i> Steyerem.	7 × 5–7	subglobose	5 rounded	hsf
<i>P. demissa</i> Standl.	8–9 × 7–8	ovoid	smooth	hsf
<i>P. dunstervilleorum</i> Steyerem.	3–4 × 4–5	globose	4 rounded	hsf
<i>P. flexiramea</i> Steyerem.	5–6 × 4–5	subglobose-ovoid	5 obtuse	hsf
<i>P. garciae</i> Steyerem.	5 × 5–7	globose	4–5 rounded	hsf
<i>P. grandiflora</i> (Kunth) Standl.	5–7 × 6–7	subglobose	4–5 rounded	hsf
<i>P. grandifolia</i> (Willd. ex Roem. et Schult.) Standl.	4 × 4	subglobose	5 rounded	hsf
<i>P. huntingii</i> Steyerem.	4 × 4	subglobose	5 acute	hsf
<i>P. insignis</i> Steyerem.	5 × 5–7	globose	4 rounded	hsf
<i>P. jahnii</i> Standl.	3–4 × 3.5–4	subglobose	3–4 obtuse	hsf
<i>P. lancigera</i> (Standl.) Steyerem.	4 × 3–3.5	elliptical	4–5 rounded	hsf

Table 1 (continued)

Species	Drupe size (mm)	Shape	Pyrene dorsal ribs	Section
<i>P. leuconeura</i> Standl.	3 × 2–2.5	elliptical-subglobose	4–5 acute	hsf
<i>P. longiflora</i> DC.	4.5–5 × 5	subglobose	5 obtuse	hsf
<i>P. longistipulata</i> Standl.	4.5–5 × 3–4	subglobose-ovoid	4–5 obtuse	hsf
<i>P. meridensis</i> Steyerem.	5 × 4	elliptical	5 rounded	hsf
<i>P. nitidella</i> (Müll.-Arg.) Standl.	4 × 3–3.5	subglobose	5 rounded	hsf
<i>P. nubicola</i> Steyerem.	8 × 6–7	ovoid	4–5 obtuse	hsf
<i>P. obtusata</i> K. Krause	4–5 × 2.5–3	ovoid		hsf
<i>P. perquadrangularis</i> Wernh.	3–3.5 × 3–3.5	globose	4–5 acute	hsf
<i>P. petiolaris</i> Kunth in HBK.	3.5–4 × 3	elliptical-subglobose	4–5 rounded	hsf
<i>P. pittieri</i> Standl.	5–5.5 × 3.5–4	ovoid	4 obtuse	hsf
<i>P. puberulenta</i> Steyerem.	10–13 × 10–13	globose	5 obtuse	hsf
<i>P. rigida</i> HBK.	5–6 × 4–5	subglobose	5 obtuse	hsf
<i>P. semirasa</i> Standl.	5–6 × 4.5–6	subglobose-ovoid	4 obtuse	hsf
<i>P. tamaensis</i> (Standl. et Steyerem.) Steyerem.	7 × 5	subglobose-ovoid	4 rounded	hsf
<i>P. tepuicola</i> Steyerem.	5 × 4	ovoid	5 rounded	hsf
<i>P. thyrsoflora</i> (Ruiz et Pav.) DC.	5–6 × 5	subglobose-ovoid	5 acute	hsf

itly 4-angular, and embedded in a fleshy mesocarpium. The fruits contain 2 pyrenes, which are triqueter, the lateral sides are curvous and the dorsal angle forms an elevated crest bordered by two marginal ribs and a channel between, which may serve as alternative or secondary germination slit (Fig. 3, right); the 2 lateral angles are bordered by irregularly crenulated marginal ribs. The cross section of the pyrene is plane-concave 3-angular. The ventral surface is flat and smooth with a central longitudinal line through introduces the endocarp into forming a keel; the germination hole is located at the basal end.

Palicourea tetragona is distributed from Mexico to Panama and *P. seemannii* from Nicaragua to Ecuador.

The above listed differences were neglected in recent monographical treatments (Taylor 2012a, b, Taylor *et al.* 2010). Since fruit and pyrene morphology are important for the distinction of different genera, our proposal is to separate the above species and erect a new genus or genera.

The two questions are whether the two species *Palicourea seemannii* and *P. tetragona* are closely related and belonging to one genus, or they are very different representing two monotypic genera? The following key gives an answer to these questions, listing their most important distinctive characters in relation to the two large genera where they were formerly placed.

Identification key to the related genera

- 1a Drupes with 6–10 longitudinal ribs or sometimes smooth surface; pyrenes 2 (5) plano-convex, with 3–5 adaxial (dorsal) ribs; cross section hemispherical or obtriangular 2
- 1b Drupes 4-angulate to 4-costate, pyrenes 2, triqueter with an elevated dorsal-central crest and 2 lateral flattened lobes with slightly thickened, irregularly crenulated margin; cross section triangular 4
- 2a Corolla tube elongate, more or less curved, gibbous, with a hairy ring inside at or above the swelling; inflorescences reddish or yellowish, corolla usually bright yellow to red *Palicourea* subgen. *Palicourea*
- 2b Corolla tube straight, not gibbous; hairy ring inside above the middle of the tube, or naked, inflorescence green or white, flowers white, pale yellow or greenish 3
- 3a Stipules usually sheathed, entire, rounded or hood-shaped at the apex, sometimes bi-aristate, brown or ferruginous, deciduous soon leaving a ring scar covered by a fringe of reddish brown hairs; leaves drying black, greyish or reddish; inflorescences green, mature fruit red *Psychotria*
- 3b Stipules usually bilobed or bidentate, green, persistent; leaves drying green, greyish or yellowish green to yellowish brown; inflorescence usually white, mature fruit blue, black or purple
Palicourea subgen. *Heteropsychotria*
- 4a Inflorescence paniculate, green to blue or violet; flowers homostylous, pedicellate, with short triangular bracts; calyx 5-lobulated; corolla blue or purple, tube gibbous at the base, puberulent outside and villous inside with two hairy rings, one above the swollen base, and the second faucial, emerging from the throat; stamens sessile or subsessile placed in the naked central part of the tube, between the two hairy rings, anthers dorsifixed near the base; pistil capitate or bidentate with two short orbicular stigmas *Ditrichanthus*



Fig. 2. The form of pyrenes on the genus *Mexocarpus*, from selected seeds of fruiting specimens of *Mexocarpus tetragonus* of MEXU (photo: A. Borhidi)

Table 2
Main distinctive features of the treated taxonomic units

Genus, subgenus	<i>Psychotria</i> s. str.	<i>Palicourea</i> subgen. <i>Heteropsychotria</i>	<i>Palicourea</i> subgen. <i>Palicourea</i>	<i>Ditrichanthus</i>	<i>Mexocarpus</i>
Fruit	6–10-ribbed	6–10-ribbed	6–10-ribbed	4-angulate	4-angulate
Number of pyrenes	2(–5)	2(–5)	2(–5)	2	2
Form of pyrenes	Plano-convex	Plano-convex	Plano-convex	Triqueteter	Triqueteter
Colour of inflorescence	Green	White	Reddish-yellow	Green-blue-violet	Green
Form of corolla tube	Straight	Straight	Curved-gibbous	Straight-gibbous	Straight
Hairiness inside the corolla	In the middle or naked	In the middle	In the swelling or above	Two rings in the swelling	In the upper third
Colour of mature fruits	Red	Blue-black-purple	Blue-black	Blue-violet	Purple-black
Colour of the corolla	White-yellow-green	Yellow-red	Yellow-red-blue-violet	Blue-purple	White
Form of stipules	Sheathed entire	Bilobate-bidentate	Tubular bidentate	Tubular lignescent	Entire triangular

- 4b Inflorescence cymose-paniculate, trichotomous, green, composed of 1–6 flowered glomerulate cymes surrounded by involucre bracts; flowers distyl, sessile; calyx tubular, truncate with undulate or denticulate margin; corolla white, tube straight, not gibbous at the base, naked inside except the upper third below the throat; stamens inserted below the hairy faucial ring, anthers dorsifixed in the middle, versatiles, emerging in the brevistyle form; style hairy, stigma bilobate with long branches *Mexocarpus*

Mexocarpus Borhidi, E. Martínez et Ramos, genus novum, hoc loco
(sect. Palicoureeae)

Type species: *Cephaëlis tetragona* Donn.-Sm., Bot. Gaz. 61: 376 (1916). Type specimen: Costa Rica. Cartago, forests de Tuis, 650 m, Oct. 1897, A. Tonduz 11352.

Arbor usque ad 30 m alta vel frutices 2.5 m alti. Stipulae laminares persistentes, coriaceae, cum aetate lignescentes et horizontaliter extensae, integrae vel breviter excisae, saepe dorso carinatae, glabrae. Folia petiolata, chartacea, concolor, in sicco viridis vel cinerascens, margine integra. Inflorescentiae 3-radiales, terminales, cymoso-

paniculatae, rami 4-angulati vel compressi, breviter ferrugineo-pubescentes in 2 latis oppositis, flores dichostyles in capitulis sessilibus 1–6-floris bracteolis 3–4 foliaceis brevibus involucrati. Hypanthium obovatum vel subglobosum, obscure 4-angulatum, limbus calycis tubularis margine undulatus vel irregulariter denticulatus, sine lobulis bene formati, utrinque glabris. Corolla alba hipocraterimorfa 25–45 mm longa, tubus 20–35 mm longus, intus basi glaber, tertio superiori hirsutus vel villosus, lobi (4–)5, oblongo-ovati vel lanceolati, 9–15 mm longi et 3–4 mm lati, apice acuti incrassati et sub anthesi reflexi, basi adaxialiter sericeo-pilosi, ceterum utrinque glabri, stamina 5, sub fauce affixa, filamenta glabra, antherae lineares, circa dimidium dorsifixae, versatiles, in floribus brevistylis e fauce leviter exsertae in floribus longistylis in tubo sub fauce inclusae, stylus supra dimidium patenter pilosus, stigma bilobatum. Fructus drupaceus, subglobosus, elipsoideus vel obovatus, 10–16 mm longus et 9–13 mm latus, 4-angulatus, tubo calycis coronatus, pyrenae 2, 3-lobata in sectione transversaria concavo-triangularia, crista centrali emergenti, lateralibus margine leviter incrassatis et irregulariter crenulatis. Semen oblong-ellipticum, ventraliter canaliculatum.

***Mexocarpus tetragonus* (Donn.-Sm.) Borhidi, E. Martínez et Ramos,**
comb. nova, hoc loco
(Figs 2–9)

Bas.: *Cephaëlis tetragona* Donn.-Sm., Bot. Gaz. 61: 376 (1916) ≡ *Palicourea tetragona* (Donn.-Sm.) C. M. Taylor, Novon 20: 490 (2010), non *Psychotria tetragona* Seem., 1867. – Syn.: *Psychotria chiapensis* Standl., Contr. U. S. Natl. Herb. 23: 1390 (1926).

Shrubs, small or large trees up to 30 m tall, trunk 20–50 cm diameter, bark smooth, much-branched with rounded crown, leafy stems 2–8 mm thick, terete, often contracted below the node after drying, glabrous or with short hairs in new growth. Stipules laminar, persistent, coriaceous, thickened and ligneous with age, 2–5 mm long, 2–4(–8) mm broad, broadly triangular to ovate, rounded or acute, entire or with a small apical sinus with 2 triangular



Fig. 3. Cross section of a pyrene of *Mexocarpus tetragonus* (Aguilar y Arcos 11455, MEXU) (photo: A. Borhidi)

lobes to 2 mm long, often with a strong white dorsal nerve, glabrous on both sides (Fig. 6), or very short puberulent abaxially, with 2 groups of ferrugineous hairs at the basal adaxial angles, green when young, later brownish to blackish, spoon-like and horizontally extended (Fig. 7). Leaves with petioles, 30–35

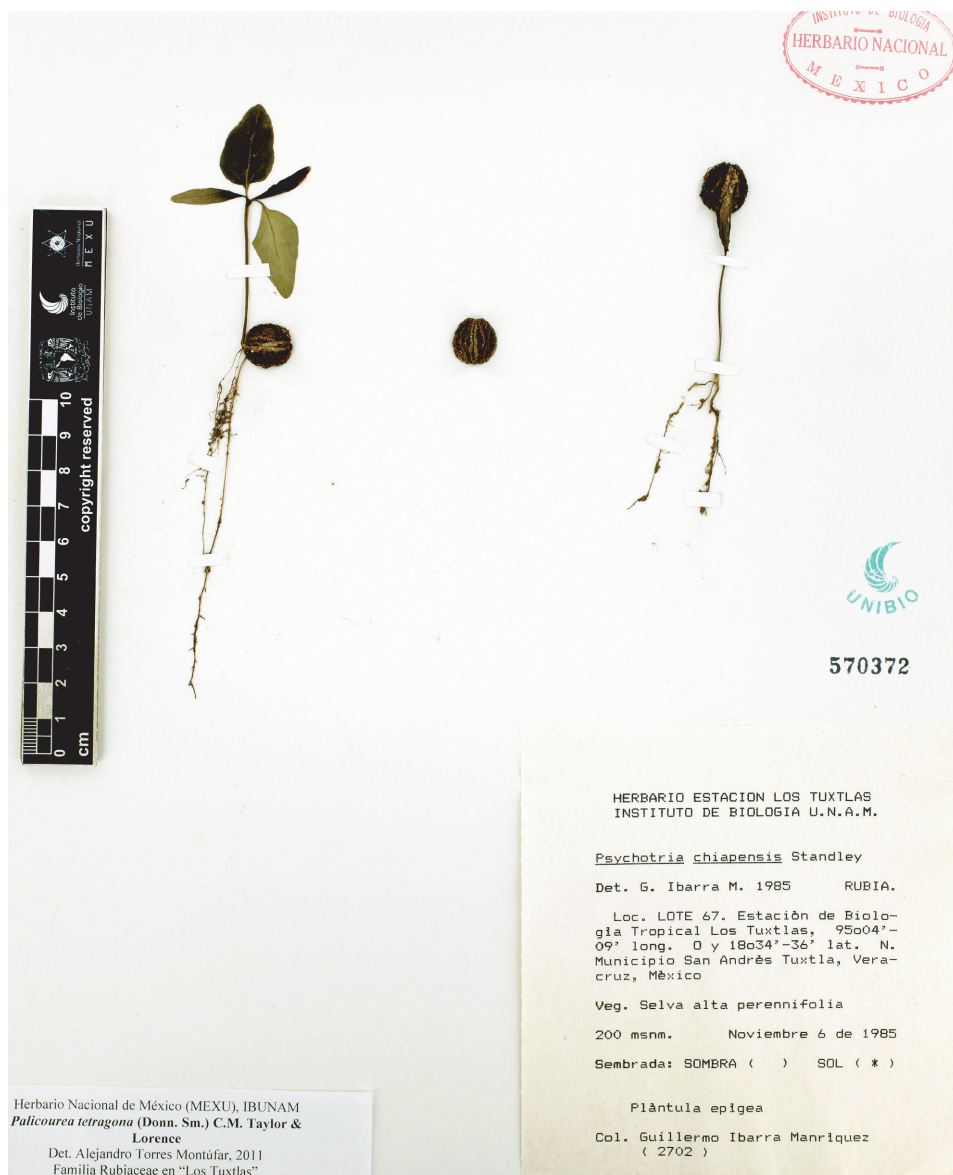


Fig. 4. Germination of *Mexocarpus tetragonus pyrenes* (G. Ibarra, M. 2702, MEXU)

mm long and 0.8–2.5 mm thick, glabrous or sometimes puberulent near the inflorescence; blades 2.5–2.8 cm long and 10–11.5 mm broad, elliptical-obovate, to elliptical-oblong or narrowly oblong-obovate, short-apiculate or acute at the apex with tip 3–10 mm long, and gradually narrowed to a cuneate base, slightly decurrent on petiole, drying thin-chartaceous and greyish green to dark brown above, paler beneath, glabrous above and below except for short hairs on the nerves beneath; lateral veins 5–13 pairs prominent with the intersecondary ones, reticulation transparent till the quaternary nerves on both sides; margin thin, entire, glabrous. Inflorescence terminal, 3-radial, cymose-corymbose 4–10 cm long, 5–8 cm broad, with 3–7 bracteolate flower clusters, peduncles compressed, 1–8–15 cm long, puberulent, bracts 2, euphylloid with petioles 1–6 mm long, blades elliptical-lanceolate, 3–5 cm long and 1.2–1.5 cm broad, principal axes 1.5–2 cm long, compressed or 4-angulate, with 2 lines short ferruginous-pubescent on the opposite sides or glabrescent, terminal branches ending in 1–6-flowered heads encircled by an involucre formed by 3–4 involucre bracteoles ±connate at the base. Flowers distylous, sessile, hypanthium obovate, 0.5–1 mm long, acute at the base, ferruginous-puberulent or glabrous. Calyx limb cylindrical, 4–6 mm long, 2–2.5 mm broad, glabrous on both sides truncate at the apex with 5 distant triangular denticles, persistent on the fruit. Corolla white, salverform, 25–45 mm long, tube 20–35 mm long, 2–3 mm broad, thickened, sericeo-pilose adaxially at the base or glabrous, hirsute or villous in the upper tertiary inside till the throat, lobes (4–)5 oblong-ovate or lanceolate, acute or obtuse, 9–15 mm long, 2–3 mm broad, thickened, reflexed, sericeo-pilose adaxially in the base, other parts glabrous. Stamens 4 or 5, filaments slender, 0.8–4 mm long, affixed 6–8 mm below the throat, anthers linear, dorsifixed in the middle, 4–5.5 mm long, 0.2–0.3 mm broad, enclosed in the longistyle form (Fig. 5D), versatile and slightly exerted in the brevistyle form (Fig. 8), style 30–35 mm long in the brevistyle form, 35–45 mm long in the longistyle form, hirsute with extended hairs above the middle, stigma bilobate with two linear, 3–4 mm long branches. Fruit globose (Fig. 9) or broadly elliptical, 4-angulate, 4-costate when dry, sometimes 6-costate when the costa become double in the commissure place, 10–16 mm long and 9–13 mm broad, crowned by the persistent calyx tube. Pyrenes 2, triqueter, triangular-concave in transversal section with an elevated central crest and two marginal ribs on the top, lateral lobes thickened at the margin, adaxial side plate. Seeds smooth at the dorsal side, with a central longitudinal slit on the ventral side. The germination hole is located at basal end.

Specimens studied: **Mexico**: Chiapas: Mpio. Cintalapa, Emilio Rabasa, S. Ochoa-Gaona 3655 (MEXU); Mpio. Palenque. 15–20 km towards Chancala on road to Bonampak from the Palenque–Ocosingo road, D. E. Breedlove 49105 (MEXU); Mpio. Las Margaritas, Maravilla Tenejapa, Alush Mendez G. 9076 (MEXU); Mpio. Ocosingo, Bonampak, J. P. Abas-

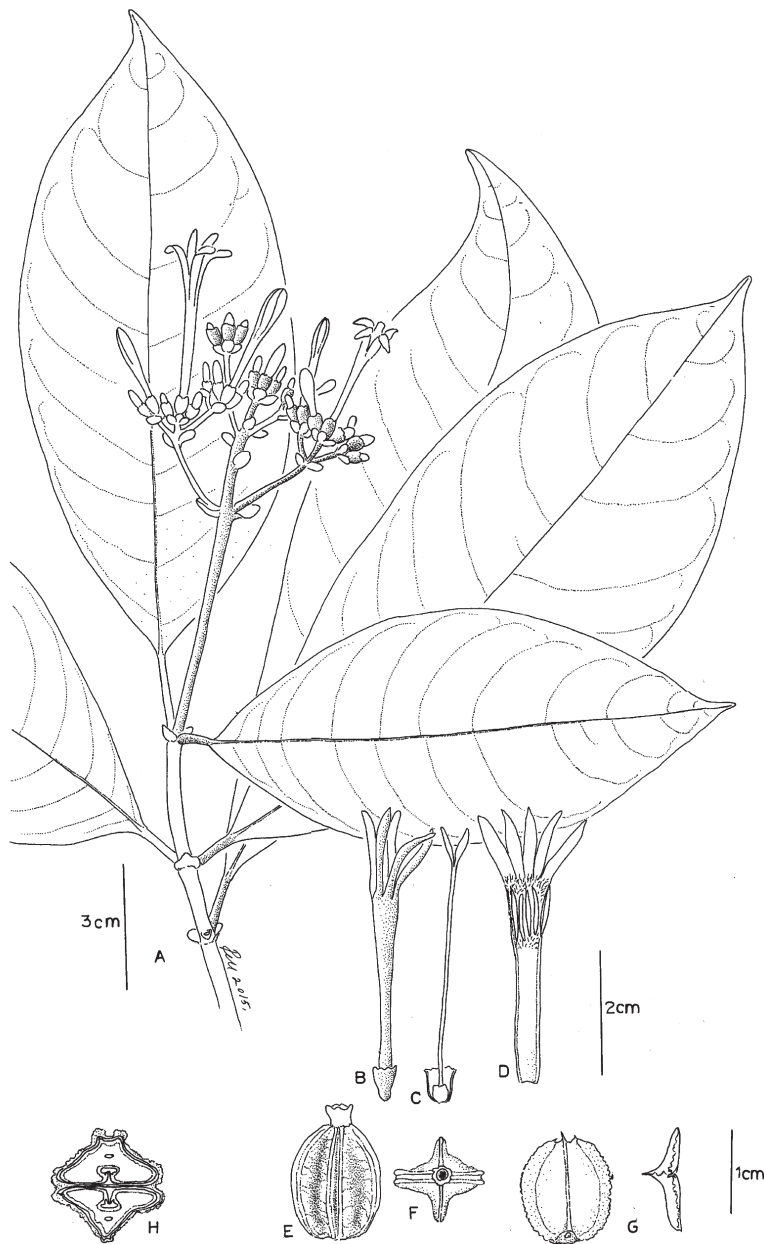


Fig. 5. *Mexocarpus tetragonus* (Donn.-Sm.) Borhidi, E. Martínez et Ramos. A = twigs with inflorescence, B = flower, C = calyx with pistil, D = corolla, longitudinal section with stamens (A–D: G. Aguilar 10695, MEXU), E = fruit, lateral view, F = fruit, apical view, G = pyrene, ventral and apical view, 2 \times , H = cross section of fruit (E–H: G. Aguilar y Arcos 11455, MEXU) (drawings by M. en C. Ramiro Cruz Durán)



Fig. 6. *Mexocarpus tetragonus*, twig with young stipules (E. Martínez 12210, MEXU) (photo: A. Borhidi)



Fig. 7. *Mexocarpus tetragonus*, twig with aged stipules (G. Juárez 3675, MEXU) (photo: A. Borhidi)

cal, 380 (MEXU); D. Álvarez, 3755 (MEXU); Laguna Lacanha, J. P. Abascal 287 (MEXU); Chansayab, G. Aguilar 3855 (MEXU); Comunidad Lacandona de Lacanha-Chansayab, G. Aguilar 7787 (MEXU); S. Levy & A. Durán 156 (MEXU); M. González-Espinosa et al. 776 (MEXU); 1106 (MEXU); Frontera Corozal, G. Aguilar, 11477 (MEXU); 10315 (MEXU); 10350 (MEXU); 10048 (MEXU); E. Martínez S. 10876 (MEXU); 12299 (MEXU); 14595 (MEXU); 15463 (MEXU); 15592 (MEXU); San Javier, G. Aguilar 5656 (MEXU); J. Calónico 25229 (MEXU); Ejido Benemérito de las Américas, E. Martínez S. 7157 (MEXU), 9401 (MEXU); Reserva Montes Azules, G. Domínguez-Vázquez 429 (MEXU); Boca Lacantun, E. Martínez S. 7621 (MEXU); 18996 (MEXU); Arroyo Puerquito, E. Martínez S, 13669 (2) (MEXU); Rio Chixoy, E. Martínez S. 15918 (MEXU); A 5.53 km al NO del Crucero San Javier, D. Álvarez 6251 (MEXU); A 3 km al NE de San Javier, G. Aguilar 4066 (MEXU); Nuevo Jerusalén, G. Aguilar 3392 (MEXU); A 1.3 km al S de El Paraíso, G. Aguilar 3650 (MEXU); Mpio.



Fig. 8. *Mexocarpus tetragonus*, brevistyle flowers (E. Martínez 12210, MEXU) (photo: A. Borhidi)

Palenque, Rio Chancalá, M. González-Espinosa et al. 862 (MEXU); 3 km al S del entronque a Chancala, T. Wendt et al. 2326 (MEXU); Mpio. Tapachula, Real Fer, E. Ventura & E. López 116 (MEXU); Oaxaca, Distrito: Juchitán, Mpio. Guichicovi. Boca del Monte, G. Juárez 3675 (MEXU); Tabasco: Mpio. Teapa, Sierra de Madrigal, A. M. Hanan, 488 (MEXU); Mpio. Tenosique, a ca. 15 km arriba de La Palma, por río a 5 km del rancho Punta de la Montaña del Sr. Angel Zubieta, C. Cowan 3376 (MEXU); Veracruz: Mpio. Catemaco, 8 km al N de Catemaco, Col.: J. H. Beaman 6170 (MEXU); Mpio. Hidalgititlán, Brecha Hnos. Cerdillo, La Laguna, 17° 16' N, 94° 37' W, alt. 200 m snm. Selva alta perennifolia, secundaria, suelo rojizo algo profundo sobre calizas. Árbol 5 m fruto verde. Col.: Brigada Vazquez 2, 14.02.1974. No. 40474 (MEXU); Mpio Las Choapas. Ceiba Blanca, J. Dorantes, et al. 2276 (MEXU); Mpio. San Andrés Tuxtla, Laguna Escondida, 3 km NO de la Estación de Biología Tropical Los Tuxtlas. Col.: G. Ibarra 2219; LOTE 67. Estación de Biología Tropical Los Tuxtlas, G. Ibarra 2702 (MEXU). – **Guatemala**: Depto. Alta Verapaz, Sebol, E. Contreras 5385 (MEXU); Depto. Izabal: Cadenas/Puerto Mendez, on Rio Dulce Road, 8 km, Elías Contreras 9852 (MEXU); Livingston, Quebrada seca. M Veliz No. MV 98.6461 (MEXU). – **Honduras**: Depto. Gracias a Dios, proposed Reserva de la Biosféra Tawahka Asangni, middle drainage of Rio Patuca. Coord.: 15° N, 84° W, Paul House 2713 (BM, MEXU); Depto. Colón Trujillo, Pat O'Mara's property behind Barrio Central Trujillo, Janice Saunders 697 (MEXU). – **Panama**: Prov. Chiriqui, Haras San Miguel, just N of Concepcion, pastureland. J. P. Folsom 3940 (MO, MEXU).

Ditrichanthus Borhidi, E. Martínez et Ramos, genus novum, hoc loco
(sect. Palicoureeae)

Typus generis: *Palicourea seemanii* Standl., Publ. Field Mus. Nat. Hist. Bot. Ser. 7: 240 (1931).

Frutex vel arbor parva 2–5 m alta, stipulae 6–12 mm longe in vaginam connatae cum lobis binis late triangularibus 4–6 mm longis, glabrae vel margine ciliatae,



Fig. 9. *Mexocarpus tetragonus*, infructescence (photo: A. Borhidi)

persistentes et cum aetate lignescentes. Folia petiolata, lamina elliptica, oblanceolata vel obovata, chartacea subra glabra, subtus ad nervos pubescens. Inflorescentiae paniculatae, terminales, verdes, caeruleae vel violaceae, valde ramosae partiales cymosae, flores homostyli, pedicellati, bracteis triangularibus brevibus suffulti. Hypanthium obconicum, glabrum vel puberulum, calyx 5-lobulatus, lobi calycis clare evolutis, corolla 10–15 mm longa, tubus 7–12 mm longus, supra basem laeviter bullatus, extus puberulus intus villosus cum anillis duabus, unum supra base, alterum supra dimidium e fauce exertum. Stamina 5, medio glabro tubi, inter anillos duos villosos affixa, sessilia vel subsessilia, antherae lineares, supra basem dorsifixae, basi bilobulatae, filamenta brevissima, glabra e base lata abrupte angustata, stylus capitatus vel brevissime bidentatus, stigma breviter orbicularia. Fructus drupaceus manifeste 4-angulatus vel 4-costatus, obovatus 6–8 mm longus et 5–6 mm latus, pyrenae trilobatae, in sectione transversali plano-concavius triangulares, crista centrali emergente et lobis lateralibus 2 applanatis et margine leviter incrassatis margine irregulariter crenulatis.

Etymology: The generic name refers to the two hairy rings inside the corolla tube.

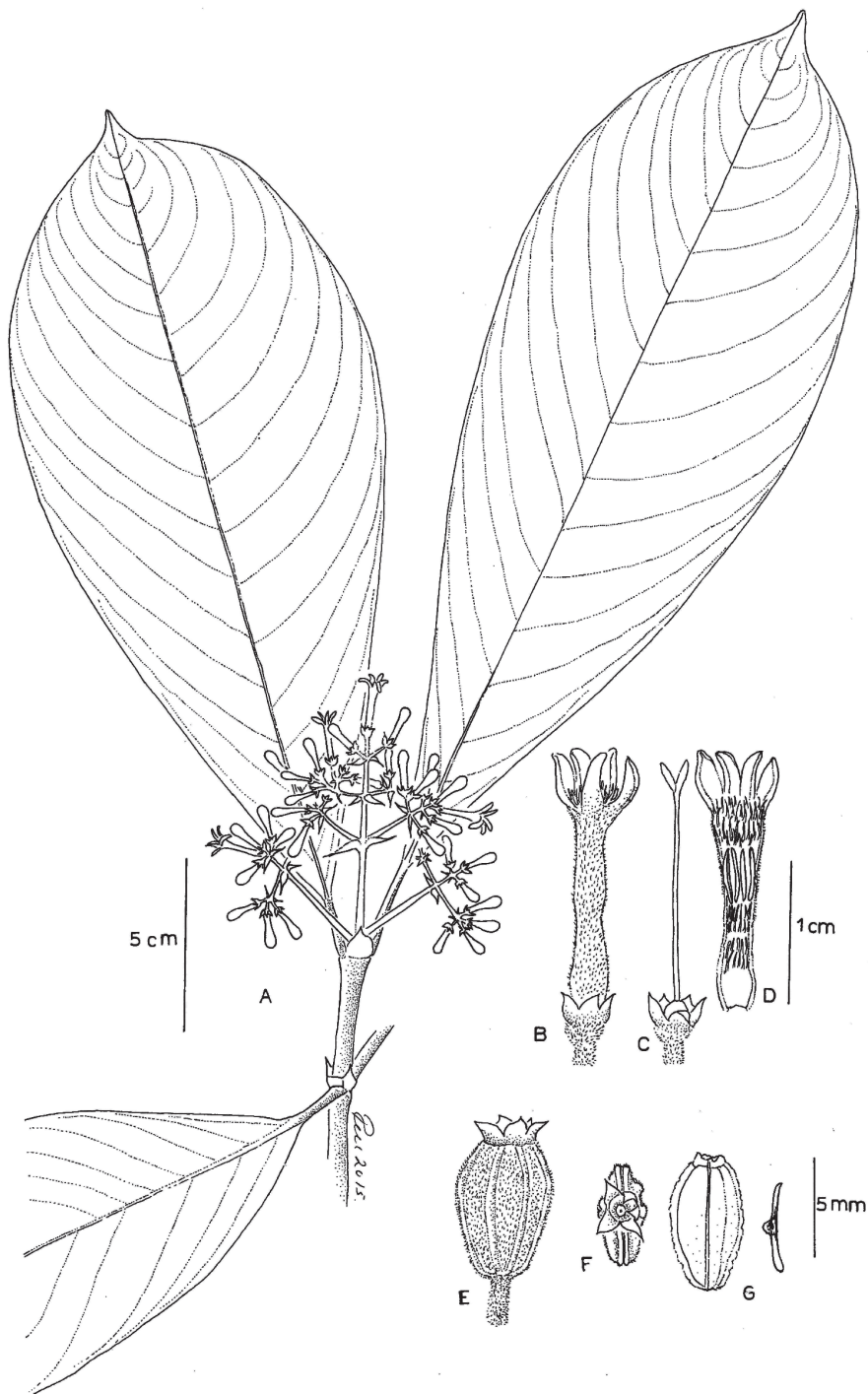
***Ditrichanthus seemannii* (Standl.) Borhidi, E. Martínez et Ramos,
comb. nova, hoc loco
(Figs 10–11)**

Bas.: *Palicourea seemannii* Standl., Publ. Field Mus. Nat. Hist. Bot. Ser. 7: 240 (1931). Holotipo: Ecuador, Seemann, sin. num. (GH). – Syn.: *Palicourea copensis* (Dwyer) C. M. Taylor, Fieldiana Bot., n.s. 33: 204 (1993) ≡ *Psychotria copensis* Dwyer, Ann. Missouri Bot. Gard. 67: 365 (1980). – *Palicourea mexiae* Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 197 (1940).

Shrubs or small treelets 2–5 m tall, leafy stems cylindrical, 2–5 mm thick, with curved or whitish hairs 0.4–0.9 mm long, or glabrescent. Stipules 6–12 mm long, united to form a broad tube to 10 mm long, 4–8 mm broad, to 14 mm broad below the inflorescences, bilobed with broadly triangular to ovate lobes 4–6 mm long, glabrous with a ciliolate margin, persistent and lignescent with age. Leaves with petioles 10–55 mm long, 1.3–2.3 mm thick, glabrous or sparsely puberulent beneath; leaf blades 9–30 cm, 3.5–14 cm broad, elliptical, oblanceolate or obovate, apex narrowly acuminate, 5–15 mm long, base cune-



Fig. 10. Ditrichanthus seemannii Borhidi, E. Martínez et Ramos. A = twig and inflorescence, B = flower, C = calyx with pistil, D = corolla, longitudinal section with stamens (A–D: Rueda et al. 10077, MEXU), E = fruit, lateral view, F = fruit, apical view, G = pyrene, ventral and lateral view, H = cross section of fruit (E–H: Croat 49150, MEXU), 4× (drawings by M. en C. Ramiro Cruz Durán)



ate and slightly decurrent on petiole, drying chartaceous, dark green above, pale green beneath, glabrous above or with a few hairs along the major veins, sparsely pubescent beneath with crooked whitish hairs 0.4–1.5 mm long, secondary veins 9–22 pairs, arcuate-ascending distally. Inflorescences green, blue or violet, terminal or pseudoaxillary, 1 or several per node, paniculate, pilose to glabrescent, peduncles 8–45 mm long, pubescent or glabrous; portion floral pyramidal, richly ramified, (2–)6–14 cm long and (3–)7–22 cm broad (without inclusion of corollas), bracts narrowly triangular, 1–9 mm long. Flowers in distal cymose or irregular clusters, with 0.5–4.5 mm long pedicels. Hypanthium obconical, 1–1.2 mm long, glabrous or pubescent, calyx green or yellowish, limb 1.5–2.9 mm long, strigillous, 1/2 to 2/3 lobate, lobes triangular to deltoid, acute, 1–3 mm long. Corolla thick, fleshy, salverform with a slightly gibbous base, lavender, blue or purple, tube 7–15 mm long, sometimes white, 2–4 mm in diameter, puberulent or densely papillose outside, and with two strong hairy rings in the inside (Fig. 10D). The tube inside glabrous at the base, strigose-villous above the base to the middle, above the middle in the staminal range glabrous or glabrescent, above the staminal range, near the throat densely strigose-villous forming a faucial hairy ring by straight rigid exerted hairs. Corolla lobes 5, ovate or triangular, 2.5–6 mm long, slightly thickened at the apex, villous adaxially at the base, the other parts naked. Stamens 5 inserted and enclosed in the middle of the corolla tube, subsessile, filaments broad at the base, filiform at the apex, purple, glabrous, up to 1.5 mm long or almost absent, anthers oblong-elliptical to linear-elliptical, 3–4 mm long and 0.3–0.5 mm broad, dorsifixed in the lower tertiary, with a black point at the apex. Style filiform, 9–12 mm long, glabrous in the low half, densely papillose-puberulous above the middle. Stigma capitate, 1–1.2 mm long, 0.6–0.8 mm broad compressed ovate or obovate, densely papillose. Fruit 6–8 mm long, 5–6 mm broad, ellipsoidal to obovate, 4-angulate or 4-costate becoming blue or violet (Fig. 11). Pyrenes 3-lobate with an elevated central crest supplied by two longitudinal marginal membranous appendices at the apex, lateral lobes with thickened, irregularly crenulate margins; concave-triangular in section transversal. Distribution: from Nicaragua through Panama and Columbia to Ecuador.

Specimens studied: **Nicaragua**: Región Autónoma del Atlántico Sur, Mpio. Nueva Guinea, reserva Indio-Maíz, río Pigibaye, entre el caño bijagua y cerro Chiripa, R. M. Rueda et al. 10077 (MEXU). – **Panama**: Comarca de San Blas, Cerro Habú, vicinity of peak, elev. 2500 ft, cloud forest, 78° 49' W, 9° 23' N, 3–5 m tree, blue flowers, green fruit, very common. Col. K. Sytsma, T. Antonio and R. Dressler 2696, 19.12.1980 (MEXU); Province of Panamá, summit of Cerro Jefe (1,000 m.) down to ca 900 m, low cloud forest (tree to 5 m, flowers blue). Col. M. Huft & S. Knapp 1714, 4.04.1982 (MEXU); Province of Panamá, summit of Cerro Jefe, and along road on E slope, 900–1,000 m, 79° 30' W, 9° 15' N, low cloud forest (tree 5 m, flowers purple, tube and petal surfaces white). Col. S. Knapp & M. Huft



Fig. 11. *Ditrichanthus seemannii*, infructescence (G. Davidse & C. W. Hamilton 23589, MEXU)
(photo: A. Borhidi)

4571, 5.04.1982 (MEXU); Province of Coclé, area between Cano Blanco del Norte, Cano Sucio and Chorro del Río Tife, 8° 42' 19" N, 80° 36' 30" W, 200–400 m elev., evergreen forest (treelet 3 m tall; fruit green with light green ribs). Col. G. Davidse & C. W. Hamilton 23589, 3.02.1983 (MEXU); Province of Coclé, Alto Calvario, cloud forest above sawmill on continental divide, 5.2 miles above El Cope; elev. 930 m (shrub 2 m, flowers blue, fruits green). Col.: Thomas B. Croat 49150, 6.12.1979 (MEXU); Province of Colon; South approach of Cerro Bruja from Río Escandaloso (tree 5 m tall, 15 cm dbh; flowers blue-white). Col.: B. Hammel 3115, 18.05.1978 (MEXU).

*

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