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Seed diversity in the Miconieae (Melastomataceae): morphological characterization and phenetic relationships

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Abstract

The seed morphology of 234 species distributed among 16 genera of the tribe Miconieae (Melastomataceae) was examined and documented with the use of scanning electron microscopy (SEM). Based on our observations and previously published investigations, we propose a set of 37 morphological characters for describing size, general shape, raphal zone, appendage, testa characters, and individual cell features of Miconieae seeds. Using these characters, we assembled detailed descriptions of all species in our sampling and constructed a data matrix for preliminary phenetic analysis (UPGMA algorithm; results to be presented elsewhere). In general, seed characters were easily identified and coded, although some of them presented difficulties, mostly due to the compression effects induced by fruit walls and neighboring seeds (e.g., shape). In contrast with other studies, we avoided the use of morphotypes, which have been shown to underutilize phenotypic variation. Our phenetic analysis does not agree with the traditional generic circumscription of the tribe, the sectional classification within *Miconia*, or with molecular phylogenetic analyses. This raises questions about the systematic and phylogenetic value of seed morphological characters in the tribe Miconieae.

Resumen

Con el uso del microscopio electrónico de barrido se examinó y documentó la morfología de las semillas de 234 especies, distribuidas en 16 géneros, de la tribu Miconieae (Melastomataceae). Con base en nuestras observaciones y apoyados en estudios previos, proponemos el uso de 37 caracteres morfológicos para describir el tamaño, la forma general, la zona rafal, el apéndice, los caracteres de la testa y las características de las células individuales de las semillas de Miconieae. Tales caracteres fueron utilizados para crear descripciones detalladas de todas las especies incluidas en nuestro muestreo y construimos una matriz de datos para efectuar un análisis fenético preliminar (algoritmo UPGMA). En términos generales, los caracteres de las semillas fueron identificados y codificados fácilmente, aunque algunos de ellos presentaron dificultades debido principalmente a los efectos de compresión inducidos por las paredes del fruto y las semillas adyacentes (p. ej., forma de la semilla). A diferencia de otros estudios, evitamos el uso de tipos morfológicos, ya que se ha demostrado que éstos subestiman la variación fenotípica. Nuestro análisis fenético no coincide con la circunscripción genérica tradicional de la tribu, ni con la clasificación seccional de *Miconia*, ni con los análisis filogenéticos moleculares. Estos resultados ponen en tela de juicio el valor sistemático y filogenético de los caracteres morfológicos de las semillas en la tribu Miconieae.

Introduction

Melastomataceae, with its 4,500–5,150 species in 166–179 genera (Claussing & Renner 2001, Almeda 2003, Mabberley 2008), is one of the largest plant families in the world (Renner 1993) and displays a diverse range of variation in vegetative and reproductive features (Renner 1993, Mendoza & Ramírez 2006). Seed morphology in the family is a noteworthy example of this diversity and has been used in the past in taxonomic and systematic investigations. Don (1823) used the general shape of the seed and the embryo for segregating

the genera of Melastomataceae into two groups. Candolle (1828) used seed characters (especially seed shape and testa features) for segregating some of his tribes and genera. Naudin (1849–1853) used the general shape of the seed for characterizing a few of his suborders, while Cogniaux (1891) relied on this feature for circumscribing tribes and used relative seed size for discriminating suborders. Parisca (1972) explored seed morphology and anatomy of the Venezuelan Melastomataceae with capsular fruits; she proposed the use of five morphological types based on general seed shape, and concluded that her types were not always characteristic of the tribes under study. Whiffin & Tomb (1972) used scanning electron microscopy (SEM) to study seed morphology of the neotropical capsular-fruited members of the Melastomataceae and reported that, in general, seed morphological features were useful for characterizing the five tribes under study. They considered seed characters to be relatively well conserved and potentially useful for studying relationships within the family; however, they found that some samples could not be unambiguously assigned to one of their five morphological types, and the seed features of some species raised questions about the position of a few genera and the circumscription of the tribes themselves.

Miconieae DC., a neotropical berry-fruited tribe of the Melastomataceae with ca. 1,800 known species (Michelangeli *et al.* 2008), has also been the subject of a series of studies to evaluate the taxonomic and systematic utility of seed morphology. Baumgratz (1985) studied fruit and seed morphology of the Brazilian Melastomataceae and, based on the work of Parisca (1972), proposed six seed morphological types. In his study, he included some genera of Miconieae (*Clidemia* D.Don, *Conostegia* D.Don, *Leandra* Raddi, *Maieta* Aublet, *Miconia* Ruiz & Pav., *Ossaea* DC., *Pleiochiton* Naudin ex A.Gray, and *Tococa* Aublet) and used seed shape, multicellular sculpture, and individual cell features for defining his categories. Like Whiffin & Tomb (1972), however, Baumgratz concluded that his seed types did not always correspond to generic or tribal classifications. Groenendijk *et al.* (1996) studied seed morphology of 75 species of *Miconia* that represented all recognized sections in the genus. Based on seed morphological features, the authors proposed a series of categories for describing seed variation. They proposed six "supertypes" that discriminated seeds according to their testa relief and 12 "types" that grouped seeds according to their testa sculpture, general appearance, and appendages. Again, like Whiffin & Tomb (1972), they found that some samples could not be placed in a particular type. They concluded that the proposed categories did not correspond to the traditional sectional classification and pointed out that seed features overlapped with other genera within Miconieae. More recently, Martin *et al.* (2008) and Martin & Michelangeli (2009) explored seed diversity within Miconieae (*Leandra*, *Miconia*, and *Ossaea*), although their studies focused on *Leandra* species. Based on their observations, Martin & Michelangeli (2009) proposed 16 morphological types, which did not agree with generic and sectional classifications, but a few correlated with some of the clades recovered by Martin *et al.* (2008). They highlighted the importance of seed morphology as a potential character for systematic purposes and recognized that expanded sampling within the tribe was needed in order to study seed morphological variation as a whole in Miconieae.

In general terms, analysis of seed morphological variation in the family has been an intricate task because of the lack of consistent terminology which would make comparisons among studies easier. For instance, features referring to anticlinal cell boundaries and sculpture of the periclinal walls (sensu Barthlott 1981 and Barthlott & Hunt 2000) have received different names under separate studies, and terminology for describing the general shape of the seed has varied (Parisca 1972, Whiffin & Tomb 1972, Baumgratz 1985, Groenendijk *et al.* 1996, Martin *et al.* 2008, Martin & Michelangeli 2009). In addition, the creation of multiple categories (including subcategories) that cannot be directly and easily compared among studies (Baumgratz 1985, Groenendijk *et al.* 1996, Martin & Michelangeli 2009) further complicates analyses. Therefore, in order to study the morphological diversity of seeds in the Miconieae, we expanded taxon sampling within the tribe and selected a number of characters proposed by Barthlott (1981), Groenendijk *et al.* (1996), and Barthlott & Hunt (2000). The overarching goal of this study is to provide a set of seed characters (but no morphotypes) that can be easily characterized and coded, with the intention of facilitating description and further analysis of seed diversity in Miconieae.

Materials and Methods

Based on available herbarium material with mature seeds, we selected specimens that represented the generic diversity within Miconieae and the currently recognized sections within *Miconia*, the largest genus in the family (Almeda 2009). We excluded the three genera recently transferred to the new tribe Henrietteeae Penneys, Michelang., Judd & Almeda (Penneys *et al.* 2010). Herbarium specimens from the collections at CAS, FLAS, NY, UPCB, and US were examined, and mature seed material was obtained. In some cases, seeds were covered by pericarp tissue that made seed observation and characterization difficult. In order to improve sample quality, a few seeds were soaked in water and exposed to a temperature of 96ºC for 30 minutes in a Bio-Rad MyCycler thermal cycler (Bio-Rad Laboratories, Hercules, California) to soften the pericarp material, thus facilitating its removal from the seed. After heat exposure, the seeds were removed from water, manually cleaned, and placed on a Kimwipe tissue for drying. Seed samples were selected at random and attached to SEM sample stubs using electroconductive tape. Seeds were placed in lateral, dorsal (antiraphal) and ventral (raphal) orientations in order to capture as much as possible all their morphological features (Figures 1A–C). Seed samples were sputter-coated at CAS with a mixture of gold-palladium and observed under a Zeiss/LEO 1450VP SEM (LEO, Cambridge, UK; Carl Zeiss SMT, Peabody, Massachussets, USA), or sputter-coated with palladium at NY and studied under a JEOL-JSM 5410LV SEM (JEOL, Tokyo, Japan).

The resulting digital images were examined, and a set of categorical characters was chosen for describing seed morphology. The terminology used for describing three-dimensional and symmetrical plane figures was based on Radford *et al.* (1976). This study follows the terminology proposed by Groenendijk *et al.* (1996) for general macromorphological features of the seed, while the studies of Barthlott (1981) and Barthlott & Hunt (2000) were used for describing testa and individual cell characteristics. Seed size (length and width) was obtained by measuring seed images with the program ImageJ version 1.45s (Rasband 1997). Selected images were further processed in Photoshop CS4 version 11.0.2 (Adobe Systems, San Jose, California, USA) to remove unnecessary background features and enhance image quality.

Seed characters were coded for the species under study with the software Mesquite version 2.75 (Madison & Madison 2009), favoring the use of reductive coding for describing complex characters (decomposition of complex features into simpler ones; Wilkinson 1995). Missing data was coded as "?", while inapplicable characters were coded as "-".

The information included in the morphological data matrix was used to prepare morphological descriptions of the seeds under study. In addition, the data matrix was used to perform a preliminary phenetic analysis in PAUP* (Swofford 2002) using the UPGMA algorithm (total character difference, unweighted least-squares option and constraining branch lengths to be non-negative) in order to explore the correspondence between morphological features and taxonomic and phylogenetic units (genera within Miconieae and sections within *Miconia*).

Results

A total of 234 species distributed in 16 genera (Table 1) were photographed and characterized, where the number of samples per species varied from two to 15, mainly depending on the quality of the sample or seed availability. *Miconia, Clidemia,* and *Leandra* were the genera with the most extensive sampling (152, 27, and 11 species respectively), while *Anaectocalyx* Triana, *Calycogonium* DC., *Killipia* Gleason, *Necramium* Britton, and *Pachyanthus* Richard were represented by only one species each.

In total, 37 characters were selected for describing seed morphological diversity. The following is a list of characters used in this study, which describe general shape and size, raphal zone, appendage, testa characters, and individual cell features of the seed. As a number of features are quite variable even within the same sample (e.g., character 23, type of anticlinal wall undulation), multistate characters were allowed in the data

matrix (Appendix I). General topological features of the seed in Miconieae (except appendages) are shown in Figures 1A–C. Average length and width values, as well as the proportional length of the raphal zone and appendage were converted into arbitrary codable intervals for their inclusion in the data matrix (the intervals were delimited according to the distribution of the values), but their numerical values are shown in the descriptions (Appendix II). An asterisk indicates that the character is not present in all species, so its absence is not mentioned in the description.

TABLE 1. Number of species sampled per genus for this study

Genus	No. of spp.
Anaectocalyx	1
Calycogonium	1
Charianthus	4
Clidemia	27
Conostegia	9
Killipia	1
Leandra	11
Maieta	2
Mecranium	4
Miconia	152
Necramium	1
Ossaea	7
Pachyanthus	1
Sagraea	2
Tetrazygia	2
Tococa	9
TOTAL	234

General shape and size (general shape does not take into account the appendage when present)

1. Three-dimensional shape: 0, ovoid (Figure 1A–C); 1, pyramidal (Figure 1D); 2, subspheroid (Figure 1E).
2. * Base of the body of the seed horizontally expanded (not to be confused with character 11, ventrally-oriented expansion of the raphal zone): 0, absent; 1, present (Figure 1F).
3. * Angulations (evaluated for seeds other than pyramidal): 0, absent; 1, present (Figure 1G).
4. Length from antiraphal view (mean; Figure 1A): 0, <0.50 mm; 1, 0.50–0.99 mm; 2, 1.00–1.99 mm; 3,
5. ≥2.00 mm (minimum and maximum values shown in the description).
6. Width from antiraphal view (mean; Figure 1A): 0, <0.5 mm; 1, 0.5–0.99 mm; 2, 1.00–1.99 mm; 3, ≥2.00 mm (minimum and maximum values shown in the description).
7. Lateral symmetrical plane: 0, ovate (Figure 1B); 1, triangular (Figure 1D); 2, circular (Figure 1E).
8. Location of the highest point perpendicular to the raphal zone: 0, toward the chalazal side (Figures 1B, 1D); 1, toward the central part of the seed (Figure 1E).
9. Antiraphal (dorsal) symmetrical plane: 0, ovate (Figure 1A); 1, triangular (Figure 1H); 2, elliptic (Figure 2A); 3, suboblong (Figure 2B); 4, circular (Figure 2C).

Raphal zone

10. Symmetrical plane: 0, ovate (Figure 1C); 1, triangular (Figure 2D); 2, circular (Figure 2E); 3, elliptic (Figure 2F); 4, suboblong (Figure 2G); 5, obovate (Figure 2H); 6, linear (Figure 3A).
11. Length proportional to the total length of the seed: 0, <70%; 1, 70–85%; 2, 90–100%; 3, >100% (Figure 3B) (approximate value shown in the descriptions).
12. Ventrally-oriented expansion of the raphal zone: 0, absent; 1, present (when the raphal zone is clearly protruding from the seed corpus; Figure 3B).

Appendage

13. * Appendage: 0, absent; 1, present (the appendage is a ventrally oriented extension of the seed corpus located at the chalazal side, with size ≥ 20% the length of the seed; Figure 1G).
14. * If present, length of the appendage proportional to the total length of the seed (percentage): 0, 20–50%; 1, 51–100%; 2, >100% (approximate value shown in the descriptions).
15. * If present, angle of the appendage with respect to the raphal zone in lateral view (Figure 3C): 0, right; 1, obtuse; 2, acute.

Testa characters

Multicellular sculpture

16. * Multicellular sculpture (relief patterns formed on the surface of the seed): 0, absent; 1, present.
17. * If present, multicellular sculpture type: 0, rugulose (Figure 3D); 1, reticulate (Figure 3E); 2, rugose (Figure 3F); 3, ruminate (Figure 3G); 4, crateriform (Figure 3H); 5, alveolate (Figure 4A); 6, tuberculate (Figure 4B); 7, oblong-net (Figure 4C).
18. * If present, location of the multicellular sculpture: 0, zonal; 1, throughout the seed.
19. * If zonal, specific location of the multicellular sculpture: 0, micropylar side; 1, lateral faces; 2, chalazal side; 3, antiraphal side.

Cell arrangement

General arrangement of the cells with respect to each other: 0, irregular pattern (Figure 4D); 1, aligned pattern (Figure 4E).

Individual cell features

20. Shape: 0, isodiametric (Figures 4E, 4F); 1, elongated (Figure 4D).
21. Relief of the anticlinal walls: 0, inconspicuous (Figure 4G); 1, channeled (Figures 4D–E); 2, raised (Figure 4H).
22. Curvature of the anticlinal walls: 0, undulate (Figures 4D–F, 4H); 1, irregularly curved (Figure 5A).
23. * If undulate, type of anticlinal wall undulation: 0, U-type (Figure 5B); 1, Ω-type (Figure 5C); 2, S-type (Figure 5D); 3, V-type (Figure 5E).
24. Relief of the periclinal walls: 0, flat to convex (Figures 4D, 4F, 5B–E); 1, par-convex [the prefix "par-" (partial) sensu Barthlott (1981), was used here for describing the condition where the curvature of the periclinal wall is only present in the central part of the cell; Figure 4E]; 2, concave (Figures 4H, 5A).
25. * If convex, type of periclinal wall: 0, nearly flat to low-convex (Figures 4D, 5B–E); 1, high convex (Figure 4F).
26. * If par-convex, periclinal wall type: 0, par-domed (Figure 4E); 1, par-conical (Figure 5F).
27. * Periclinal walls dividing into two or more segments: 0, absent; 1, present (Figure 5G).

28. Microrelief of the periclinal walls: 0, absent; 1, present.
29. * If present, microrelief type: 0, striate (Figure 5F); 1, punctate (Figures 4G, 5H); 2, verrucose (Figure 6A).
30. * Cells with features differing from the rest of the seed corpus: 0, absent; 1, present (Figure 6B).
31. * Location of the cells with features differing from the rest of the seed corpus: 0, toward the raphal zone; 1, chalazal side; 2, angulations; 3, lateral sides; 4, throughout the seed; 5, appendage; 6, micropylar side.
32. * Shape of the cells with features differing from the rest of the seed corpus: 0, same, 1, different (isodiametric).
33. * Curvature of the anticlinal walls of the cells with features differing from the rest of the seed corpus: 0, same; 1, different.
34. * If different, type of curvature of the anticlinal walls: 0, undulate; 1, irregularly curved.
35. * Relief of the periclinal walls of the cells with features differing from the rest of the seed corpus: 0, same; 1, different.
36. * If different, type of relief of the periclinal walls: 0, convex; 1, par-convex (par-domed); 2, concave.
37. * If convex, type of relief of the periclinal walls: 0, low-domed; 1, high-domed.

The characterization of individual cell features was done considering the compression effects on the seeds caused by pericarp tissue and neighboring seeds (Figure 6C), which may impact micromorphological features (Figures 6D–G; Whiffin & Tomb (1972), Groenendijk *et al.* 1996). In addition, pericarp tissue that may adhere to the seed surface can obscure cell morphology, or it may be confused with other seed features (e.g., microrelief of the periclinal walls; Figure 6H).

Seed images in lateral view (or antiraphal view if stated), with the raphal zone pointing downward and the micropylar side oriented to the right, and close-ups of the seed surface of the species under study are shown in Figures 7–65. Additional SEM images will be available at http://sweetgum.nybg.org/melastomataceae/. All SEM images were taken by the senior author of this study unless otherwise stated.

Unrooted UPGMA trees representing the phenetic relationships among the species are shown in Figure 66. Genera within Miconieae (Figure 66A) and recognized sections of *Miconia* (Figure 66B) were color-coded to show their relationships using seed morphological data. In either case, the traditionally recognized genera of Miconieae and the sections of *Miconia* do not form discrete groups, and are intermixed with samples representing other taxa.

Discussion

In this study we propose the use of a set of characters to facilitate descriptive work of seed morphology in the tribe Miconieae. We took advantage of some of the general features already discussed by Groenendijk *et al.* (1996) for the seeds of *Miconia*, as well as of the detailed works on seed morphology by Barthlott (1981) and Barthlott & Hunt (2000). In particular, the latter two studies were extremely useful for describing individual cell features, and have been used to some extent in other investigations in the Miconieae (e.g., Groenendijk *et al.* 1996, Martin & Michelangeli 2009). In general terms, the characterization of seed features was straightforward; however, some samples showed deformations that may be attributed to compression effects caused by neighboring seeds and/or fruit walls (e.g., *Leandra granatensis* Gleason, Figure 6C; *Necramium gigantophyllum* Britton, Figure 6D). Such deformations were noted by Groenendijk *et al.* (1996), who suggested that such compression was responsible for defining the shape and the multicellular sculpture of the seed. This compression is usually found on the lateral sides and toward the antiraphal side, and its presence can vary from absent to conspicuous within the same species. In addition, our observations agree with Whiffin & Tomb (1972) in that the compression effects may cause deformations on the anticlinal and periclinal walls (e.g., *Ossaea micrantha* (Sw.) Macfad. ex Cogn., Figure 6E; *O. brenesii* Standl., Figure 6F; *O. spicata* Gleason, Figure 6G), which potentially make cell description difficult or can lead to a mischaracterization of cell features. Therefore, it is important to examine as many samples as possible to detect the variation caused by compression effects and to separate it from normal seed features.

General shape and size

Size and shape are among the characters that have been used in previous studies for circumscribing general morphological types in the family (e.g., Don 1823, Candolle 1828, Parisca 1972, Baumgratz 1985, Groenendijk *et al.* 1996, Martin & Michelangeli 2009). Seed size seems to be relatively constant within species, but seed shape may change dramatically even within the same fruit, thus making the process of shape characterization a difficult task. For this study, we opted for the use of a simple three-dimensional terminology, an approach similar to the one implemented by Groenendijk *et al.* (1996); the use of relative terms (narrow/wide) in the data matrix was avoided in this study, but are used in the morphological descriptions. Seed shape of some species of *Charianthus* D.Don (e.g., *C. purpureus* D.Don, Figure 8C) and *Miconia* (e.g., *M. affinis* DC., Figure 22E) vary from ovoid to pyramidal, which is likely due to the degree of compression created by neighboring tissues. Here we considered a seed to have a pyramidal shape when angulations and an angled apex were present on the antiraphal side (e.g., *Miconia ibaguensis* (Bonpl.) Triana, Figure 1D; *M. tomentosa* (Rich.) D.Don ex DC., Figure 2B). Sometimes both features were difficult to assess without ambiguity. Description of the lateral and antiraphal symmetrical planes (the former used by Martin & Michelangeli 2009) were found to be a useful aid for complementing shape description; however, seed shape variation in Miconieae behaves as a continuum which can be difficult to delimit into discrete units, and the homology of these features may be questionable. Preliminary morphometric analyses suggest that seed shape can be more objectively evaluated using quantitative data (e.g., Elliptic Fourier descriptors; Ocampo & Kriebel unpublished data) and may prove to be a useful tool for understanding seed shape variation in the tribe.

Raphal zone

This structure has been named in other studies as a scar (Parisca 1972), raphe (Whiffin & Tomb 1972, Martin & Michelangeli 2009) and raphal part (Groenendijk *et al.* 1996). In this study, we consider the raphe to be a ridge formed by the portion of the funiculus (a continuation of the funicular vascular bundle) adnate to the anatropous or subcampylotropous seeds that runs from the hilum to the chalaza (Radford *et al.* 1976, Sousa & Zárate 1988, Harris & Harris 2001, Kesseler & Stuppy 2006). Therefore, the raphal zone (e.g., *Leandra melanodesma* (Naudin) Cogn., Figure 1C) comprises the raphe, the hilum, and the surrounding tissue on the ventral part of the seed, which has different cell morphological features than the corpus. Martin & Michelangeli (2009) coded the presence/absence of an evident funicular fragment that projects apically in seeds of some species of *Leandra* ("extension of the hilum" in that study). We observed this character in some of our samples, but the trait was not consistently present in all the seeds of the same species, so this funicular tissue was not coded here. In addition, individual cell characters are typically difficult or impossible to characterize, so were not considered in this study.

The symmetrical plane is formed by the funicular area that is in contact with the seed and may be variable within the same species (e.g., *Charianthus nodosus* (Desr.) Triana, *Clidemia fraterna* Gleason, *Miconia friedmaniorum* Almeda & Umaña). In contrast, the size of the raphal zone remains relatively constant and provides information about the orientation of the seed in relation to the funiculus: seeds with relatively long raphal zones are anatropous (e.g., *Leandra melanodesma*, Figure 1B; *Clidemia caudata* Wurdack, Figure 2D; *M. rugosa* Triana, Figure 2G), while shorter ones reflect different degrees of subcampylotropy (e.g., *M. laevigata* (L.) DC., Figure 2F; *Tococa spadiciflora* Triana, Figure 2H); however, this distinction is not always clear and warrants more detailed observations (e.g., *M. chartacea* Triana, Figure 2E).

The raphal zone is usually flat and/or slightly concave (e.g., *Leandra melanodesma*, Figure 1C; *Miconia chartacea*, Figure 2E; *M. laevigata*, Figure 2F; *Tococa spadiciflora*, Figure 2H). It can be strongly concave (e.g., *Leandra reversa* (DC.) Cogn., *Miconia chrysophylla* (Rich.) Urb., *M. multiplinervia* Cogn., *M. pusilliflora* (DC.) Naudin) to horizontally and/or ventrally expanded and clearly protruding from the corpus of the seed (e.g., *Clidemia quinquenervia* (Mill.) Almeda, Figure 13E; *C. reitziana* Cogn. & Gleason, Figure

13G; *M. anderssonii* Wurdack, Figure 23G; *M. ligustrina* (Sm.) Triana, Figure 40E; *M. livida* Triana, Figure 40G; *T. macrophysca* Spruce ex Triana, Figure 63E). Our observations concur with Groenendijk *et al.* (1996) in that the relief of the raphal zone is variable within the same species (the swelling was hypothesized by those authors to be caused by higher water content), although the raphal zone of some taxa is consistently expanded in a ventral direction. Therefore, description of this feature is included in our study. Corner (1976) reported that some Melastomataceae have a thickened raphe and he proposed that it could be a vestigial aril, while Groenendijk *et al.* (1996) considered this structure a raphal appendage.

Appendage

An appendage is defined as a supplementary or secondary part attached to a main structure (Sousa & Zárate 1988, Harris & Harris 2001). Martin & Michelangeli (2009), in the context of Miconieae, considered the structure an "extra membrane at the antihilum side of the seed with a ventral/raphe side orientation", and was a critical feature for discriminating their morphotypes. Although location and orientation of the appendage is useful in defining this structure in the Miconieae, it is not always easy to identify. For instance, anatomical sections were required to identify the appendage in the seeds of *Miconia* aff. *radulaefolia* (Benth.) Naudin (Figure 1G in Martin & Michelangeli 2009) which grows on the chalazal side in an anteroposterior axis. On the other hand, the seed of *Ossaea ovatifolia* Urb. (Figure 1J in Martin & Michelangeli 2009) was described in a group of taxa lacking appendages (type III), but displays a well-defined structure that may be considered an appendage. Additionally, our study found that a number of samples have small protuberances at the chalazal end of the raphal zone; these structures may vary from non-existent to conspicuous (ca. 10% the length of the seed), and could also potentially be considered appendages (e.g., *M. ibaguensis*, Figure 1D; *Calycogonium glabratum* (Sw.) DC., Figure 7C; *Charianthus alpinus* (Sw.) R.A.Howard, Figure 7E; *Ch. dominicensis* Penneys & Judd, Figure 7G). For purposes of this study we consider an appendage a conspicuous, ventrally oriented extension of the seed corpus (with variable degree of inclination with respect to the raphal zone) located at the chalazal side, with size ≥ 20% the length of the seed (e.g., *M. dispar* Benth., Figure 1G; *Clidemia caudata*, Figure 8G; *C. charadrophylla* Tutin, Figure 9A; *C. heptamera* Wurdack, Figure 12A).

It is clear that more studies are needed to unambiguously identify and define this structure, as well as to understand its evolution and function. Martin *et al.* (2008) found that the appendage evolved independently multiple times in *Leandra*; Martin & Michelangeli (2009) hypothesized that seed appendages in the genus are not homologous because of differences in their relative position with respect to the seed embryo. Although the function of the appendage is not understood, it has been speculated that appendages may promote post-dispersal myrmecochory (due to the hypothetical presence of elaiosomes; Groenendijk *et al.* 1996). It could facilitate seed germination (occurrence of perforations; Martin & Michelangeli 2009) or possibly serve as a flotation device for water dispersal in wet environments.

Testa characters

The multicellular sculpture describes the relief patterns that are formed on the surface of the seed (e.g., *Miconia cuspidata* Naudin, Figure 3D; *M. pulvinata* Gleason, Figure 3E; *M. reducens* Triana, Figure 3F; *M. amplinodis* Umaña & Almeda, Figure 3G; *M. brachybotrya* Triana, Figure 3H; *M. dodecandra* (Desr.) Cogn., Figure 4A; *M. serrulata* (DC.) Naudin, Figure 4B; *Clidemia charadrophylla*, Figure 4C), which are very likely caused by the endocarp cells (Groenendijk *et al.* 1996). Anatomical sections of seeds of *Arthrostemma ciliatum* Pav. ex D.Don (Melastomataceae: Rhexieae DC.) show that multicellular sculpture is formed by the aggregation of epidermal cells (Whiffin & Tomb 1972), rather than by the hypodermal tissue (e.g., Elisens 1985). Baumgratz (1985) used this feature to some extent, although he treated multicellular sculpture and individual cell features (periclinal cell wall relief) as part of the same character for describing variation of the testa at a macroscopic level. Other studies have treated the multicellular sculpture as "testa sculpture" or "three-dimensional pattern of seed surface" (Groenendijk *et al.* 1996, Martin & Michelangeli 2009), and it

was used by Groenendijk *et al.* (1996) for circumscribing their seed "supertypes." Although those two studies reported three different types of multicellular sculpture (including the smooth pattern), expanded sampling of the Miconieae has revealed that this is a diverse character (eight states). The patterns and their location are consistent within the same species, but it is not uncommon to find seeds with two multicellular sculpture types (e.g., *M. astroplocama* Donn. Sm., Figure 25A; *M. dodecandra*, Figure 32A). Further studies are needed to define the role of sculpturing in seed protection, dispersal and establishment (Groenendijk *et al.* 1996), and to understand the developmental nature of the multicellular sculpture in the tribe.

Individual cell features

These characters are used for describing the shape of individual cells, as well as their anticlinal and periclinal cell wall features as recommended by Barthlott (1981) and Barthlott & Hunt (2000). A subset of these characters has been employed in other studies of the Melastomataceae (Groenendijk *et al.* 1996, Michelangeli 2000, Martin *et al.* 2008, Martin & Michelangeli 2009). Terminology has been applied with some modifications, especially concerning the types of periclinal wall relief in Martin *et al.* (2008) and Martin & Michelangeli (2009) (the former study incorrectly considered anticlinal walls as periclinal walls and vice versa).

The identification of these characters is usually straightforward, although in some cases the curvature of anticlinal walls is not evident (e.g., *Miconia marginata* Triana, Figures 4G, 43D; *M. acuminata* (Steud.) Naudin, Figure 22B), or its features are masked by the close contact of the periclinal walls of neighboring cells (e.g., *Clidemia capitata* Benth., Figure 8F; *M. longispicata* Triana, Figure 41F). Although most of the cell features seem to be well conserved within species, anticlinal cell wall undulations are labile and multiple types can be found in the same seed (e.g., *M. costaricensis* Cogn., Figure 30B; *M. jahnii* Pittier, Figure 37F; *M. latecrenata* (DC.) Naudin, Figure 39D). Our observations agree with Whiffin & Tomb (1972) and Groenendijk *et al.* (1996) in that compression caused by the packing of neighboring seeds can affect cell periclinal wall relief. This can especially impact cells on the lateral sides of the seed, making them vary from convex to almost flat (e.g., *Necramium gigantophyllum*, Figure 6D; *M. duckei* Cogn., Figure 33B; *M. labiakana* R.Goldenberg & C.V.Martin, Figure 38C; *M. nystroemii* Ekman ex Urb., Figure 45C; *M. selleana* Urb. & Ekman, Figure 52E). It is unclear if the relief and/or the microrelief of the periclinal cell walls have a functional role, but it has been suggested that micromorphological features of plant surfaces may act as a protection barrier against biotic and abiotic factors (Koch *et al.* 2008). The verrucose and striate periclinal cell wall microrelief types seem to be formed by cuticular foldings or thickenings (e.g., *Leandra dichotoma* (Pav. ex D.Don) Cogn., Figure 6A; *C. discolor* (Triana) Cogn., Figure 10F; *M. campestris* (Benth.) Triana, Figure 28B), but the wartlike projections on the seeds of *Arthrostemma ciliatum*, a capsular-fruited species, appear to be part of the cell wall (Whiffin & Tomb 1972), raising questions about the homology of this feature.

Although it is not common, a few species have seeds with evidently different micromorphology (e.g., *Clidemia heptamera*, Figure 12A; *Maieta guianensis* Aubl., Figure 20E; *Miconia affinis*, Figure 22E; *M. duckei*, Figure 33A). The features that commonly vary are the shape and size of the cells, the undulations of the anticlinal walls, and the relief of the periclinal walls. In most cases, these differences seem to be the result of compression effects caused by neighboring cells, where the degree of convexity of the cells is affected. Although this study takes into account compression effects with caution, a number of seeds constantly display cells with heterogeneous morphological features. This is the case with cells on the edges of some angulated seeds that differ from cells on the rest of the corpus (e.g., *Miconia ligulata* Almeda, Figure 40C; *M. marginata*, Figure 43C). Therefore, variation of this kind that is constant is considered to be a distinct feature within these species. In addition, there are some cases where the appendage displays different cell features than those on the rest of the seed. This has been noted by Groenendijk *et al.* (1996), Martin *et al.* (2008), and Martin & Michelangeli (2009). In general, there are two different patterns: one where the cells of the appendage are usually larger and the anticlinal walls appear irregularly curved (e.g., *Miconia procumbens* (Gleason) Wurdack, Figure 48A; *M. trimera* Wurdack, Figure 58C; *Sagraea scalpta* (Vent.) Naudin, Figure

62E), and another where size and both anticlinal and periclinal cell wall attributes are different when compared to the cells of the rest of the seed (e.g., *Clidemia heptamera*, Figure 12A; *Miconia aliquantula* Wurdack, Figure 23C; *M. centrodesma* Naudin, Figure 28E). The functional aspects of a heterogeneous micromorphology are unknown, although Groenendijk *et al.* (1996) speculated that the cells found on the appendage of *Miconia centrodesma* (Figure 28E) function as elaiosomes, thus promoting seed dispersal by ants.

Seed morphotypes and composite coding

The aim of this study is to provide a set of morphological characters to describe size, general shape, raphal zone, appendage, testa characters, and individual cell features of Miconieae seeds. These can be subjected to further analyses using a phylogenetic framework (Ocampo & Almeda unpublished data). Although other studies in the Melastomataceae have provided useful and valuable information with respect to seed morphology, a number of them have consolidated diverse seed characters into general morphological types (Parisca 1972, Whiffin & Tomb 1972, Baumgratz 1985, Groenendijk *et al.* 1996, Martin *et al.* 2008, Martin & Michelangeli 2009). This approach, also known as composite coding (Wilkinson 1995), combines independent morphological features to define a single character state. In some cases, creation of multiple general morphological types may produce an unnecessarily complex scheme and can potentially create confusion (e.g., Groenendijk *et al.* 1996, Martin & Michelangeli 2009). In some studies, subcategories are created for describing slight variations of the general types, and special categories are created to accommodate samples with heterogeneous morphologies that do not fit any of the proposed types (e.g., Dressler 1993, Groenendijk *et al.* 1996). Composite coding may be convenient for describing complex morphological structures, but it may underutilize the phenotypic variation and even produce artificial resolution in phylogenetic analysis (Simmons & Freudenstein 2002). Because of the limitations of the composite coding approach, this study avoids the usage or proposal of general morphological types. We believe that the study of individual cell features will facilitate the description of seed diversity and will allow a more objective evaluation of the diversification patterns in this morphologically diverse tribe.

Insights into taxonomic and systematic utility of seed features

Due to the wide range of morphological variation, seed characters have long been used for circumscribing intrafamilial groups in the Melastomataceae (e.g., Don 1823, Candolle 1828, Naudin 1849–1853, Cogniaux 1891). The use of the SEM in biological investigations has facilitated the study of seed morphological diversity in more detail, identifying additional characters for more rigorous evaluations (e.g., Whiffin & Tomb 1972, Groenendijk *et al.* 1996, Michelangeli 2000, Martin *et al.* 2008, Martin & Michelangeli 2009). Recent studies that have focused on the Melastomataceae have concluded that seed morphology does not always correlate with tribal, generic, or sectional classifications. In addition, it has been proposed that seed characters can be useful in assessing relationships among capsular-fruited groups within the family. This suggestion has been made under the assumption that seed morphology is conserved and has a phylogenetic signal (e.g., Whiffin & Tomb 1972). Enhanced sampling of the capsular-fruited clades should provide much needed comparative data. Martin *et al.* (2008) showed that certain morphotypes correlated with some clades of the polyphyletic berry-fruited *Leandra*, although seed features were evaluated only for a representative sample of that genus.

This study makes no attempt to evaluate the systematic and phylogenetic utility of seed features in the Miconieae. This is a topic that will be addressed elsewhere (Ocampo & Almeda unpublished data). However, our phenetic analysis allows us to offer a few preliminary insights. The UPGMA tree agrees with Groenendijk *et al.* (1996) in that seed features do not correlate with the sectional classification of *Miconia* (Figure 66B). In addition, analysis of seed morphological data is consistent with the results of molecular studies in that there is no support for recognizing the current generic circumscription within Miconieae (Figure 66A; Goldenberg *et*

al. 2008, Michelangeli *et al.* 2008). However, the two data sets do not agree with each other. It is noteworthy that our analysis only recovers the group known as the "scorpioid *Leandra-Ossaea* clade" (Goldenberg *et al.* 2008, Martin *et al.* 2008) with the exception of *O. capillaris* (D.Don) Cogn., also a member of that group (Goldenberg *et al.* 2008, Ocampo, unpublished data). Martin *et al.* (2008) did not include *O. capillaris* in their study, whose seeds were described by Martin & Michelangeli (2009) as being "type XIV", in contrast to the other members of the clade which were characterized as "type IX". This raises questions about the phylogenetic importance of seed features in the Miconieae. Although it is currently premature to make judgments, our observations and results suggest that seed features are labile in the group and may be of limited value for circumscribing genera and higher taxonomic categories, and for estimating the evolutionary history within the tribe. It does seem, however, that seed morphology in concert with other morphological characters may be taxonomically useful at the species level.

Concluding remarks

Based on the study of multiple seed samples using SEM, we have proposed a set of characters that can be useful for describing seed diversity in the Miconieae. Although we are proposing these characters as the descriptive data set for addressing systematic and evolutionary questions, our sampling is limited (representing ca. 13% of the tribal diversity) and incorporation of supplementary taxa may require further character reassessment. Furthermore, it is evident that more developmental and anatomical studies are needed to understand the nature of these features and to evaluate their homology. In our efforts to better describe and understand seed morphological diversification in this large and diverse tribe of Melastomataceae, we offer this study as a contribution that will require constant reevaluation as new and more complete evidence comes to light.

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APPENDIX I. Character data matrix. Numbers correspond to characters and character states shown in the Results section. ? = missing data; - = inapplicable.

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Anaectocalyx bracteosa	0	0	1	1	0	0	0	0	0	2	0	0	-	-	1	1	0	0	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Calycogonium glabratum	0	0	1	1	0	0&1	0	0	0	2	0	0	-	-	1	7	1	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Charianthus alpinus	0&1	0	1	1	0	0	0	0&3	0&7	2	0	0	-	-	1	7	0	1&3	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Charianthus dominicensis	0&1	0	1	1	0	0&1	0	0&3	5	2	0	0	-	-	1	7	0	1	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Charianthus nodosus	0	0	1	1	0	0&1	0	0&3	1&5	2	0	0	-	-	1	7	0	1	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Charianthus purpureus	0&1	0	1	1	0	0&1	0	0	5	2	0	0	-	-	1	7	0	3	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia capitata	0	0	1	2	1	0	0	0	0	2	0	0	-	-	0	-	-	-	1	1	1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia caudata	1	0	-	1	0	1	0	0&1	1	1	0	1	0	0	1	7	0	1&3	0	1	1	0	0	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Clidemia charadrophylla	1	0	-	1	0	1	0	1	1	1	0	1	0	0&1	1	7	0	1	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Clidemia ciliata	0	0	0	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	2	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia clandestina	0	0	1	1	1	0	0	0	0	1	0	0	-	-	1	2	0	2	0	1	1	0	0	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia crenulata	0	0	1	1	0	0	0	0&3	0	1	0	0	-	-	0	-	-	-	0	0	1	0	0&1	1	-	1	0	1	1	1	3	0	0	-	1	0	1
Clidemia debilis	0	0	0	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	1	1	1	0	0	0	1	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia densiflora	1	0	-	1	0	1	0&1	3	5	1	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Clidemia discolor	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Clidemia domingensis	0	0	0	1	0	0	1	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	0	1	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia fendleri	0	0	0	1	0	0	0	0	0	2	0	0	-	-	1	7	0	1	1	1	1	0	0&1	0	1	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia fraterna	1	0	-	0	0	1	0&1	1	0&1	2	0	0	-	-	1	7	0	3	1	1	1	0	0&1	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia garciabarrigae	0	0	1	1	0	0	0	0	0&3	0	0	0	-	-	1	2	0	2	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia globuliflora	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	0	1	0	0&1	1	-	0	0	0	-	0	-	-	-	-	-	-	-
Clidemia heptamera	0	0	1	1	0	0&1	0	0	5	1	0	1	0	0&1	1	4	0	2	1	1	1	0	0&1	1	-	0	0	0	-	1	5	1	1	1	1	0	1
Clidemia inobsepta	0	0	0	0	0	0	1	0	0	2	0	0	-	-	1	1	1	-	0	1	1	0	1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Clidemia monantha	0	0	0	1	0	0	0	0&2	0	1	0	0	-	-	0	-	-	-	0	0	1	0	0&1	1	-	0	1	0	-	0	-	-	-	-	-	-	-
Clidemia octona	0	0	0	0	0	0	0	0&2	0	1	0	0	-	-	1	6	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia pittieri	0	0	1	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Clidemia pustulata	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	-	-	1	1	1	0	0&1	1	-	0	0	1	0	0	-	-	-	-	-	-	-
Clidemia quinquenervia	0	0	1	0	0	0	0	0	5	3	1	0	-	-	0	-	-	-	0	1	1	0	1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Clidemia reitziana	0	0	1	0	0	0	0	0	5	3	1	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Clidemia rubra	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	1	0	2	0	1	1	0	0&1	0	1	-	1	0	-	0	-	-	-	-	-	-	-
Clidemia setosa	0	0	0	1	0	0	1	2	0	1	0	0	-	-	1	6	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Clidemia tenebrosa	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	1	0	1	0	1	1	0	0	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Clidemia umbellata	0	0	0	0	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Clidemia umbrosa	0	0	0	0	0	0	0&1	0	0	1	0	1	0	1	1	4	1	-	0	1	1	0	0	1	-	0	0	1	0	1	5	0	1	1	1	0	1

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Conostegia bigibbosa	0	0	0	1	0	0	0	2	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Conostegia centronioides	0	0	1	0	0	0	0	0	5	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Conostegia lasiopoda	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	1	0	2	0	1	1	0	0	0	0	-	0	0	-	1	1	0	0	-	1	1	-
Conostegia macrantha	0	0	0	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0&3	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Conostegia micrantha	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Conostegia oerstediana	0	0	0	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Conostegia speciosa	0	1	1	2	1	0	0	0	0	2	0	0	-	-	1	7	0	1	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Conostegia subcrustulata	0	1	1	2	1	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Conostegia xalapensis	0	1	1	1	1	0	0	0&1	1	2	0	0	-	-	0	-	-	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Killipia verticalis	0	0	0	0	0	0	0	0	6	1	0	0	-	-	0	-	-	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Leandra agrestis	0	0	0	0	0	0	0&1	0	0	0	0	0	-	-	0	-	-	-	1	0	1	0	0&1	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra dichotoma	0	0	0	0	0	0	1	2	2	1	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra divaricata	0	0	0	0	0	0	0	0&2	2	0	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra fallacissima	0	0	1	1	0	0	0&1	0&1	0	2	0	0	-	-	0	-	-	-	0	1	1	0	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Leandra granatensis	0	0	0	0	0	0	0&1	0&2	2	1	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra longicoma	0	0	0	0	0	0	0	0&2	2&3	1	0	0	-	-	0	-	-	-	1	0&1	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra macdanielii	0	0	0	0	0	0	0	0	0&3	0	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra melanodesma	0	0	0	0	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Leandra reversa	0	0	0	0	0	0	0	0&2	0&3	0	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	0	-	0	-	-	-	-	-	-	-
Leandra rhamnifolia	0	0	0	0	0	0	0	0	2	0	0	0	-	-	0	-	-	-	1	0	1	0	0	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Leandra subulata	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	6	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Maieta guianensis	1	0	-	1	0	1	0	1&3	6	1	0	0	-	-	1	1	0	2	0	1	1	0	0&1	0	0	-	0	1	0	1	2	0	0	-	1	0	1
Maieta poeppigii	0	0	1	1	0	0	0	0	3	1	0	0	-	-	1	1	0	2	0	1	1	0	0	0	0	-	0	1	0	1	2	0	0	-	1	0	1
Mecranium acuminatum	0	0	0	0	0	0	0&1	0&2	0	2	0	0	-	-	0	-	-	-	1	0	1	0	0	0	1	-	0	1	2	0	-	-	-	-	-	-	-
Mecranium haemanthum	0	0	0	0	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0&1	0	1	-	0	1	0	0	-	-	-	-	-	-	-
Mecranium ovatum	0	0	0	1	0	0	0&1	0	0	1	0	0	-	-	1	7	0	0	1	1	1	0	1	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Mecranium septentrionale	0	0	0	1	0	0	0	0	0	2	0	0	-	-	1	7	0	0&1	1	1	1	0	1	0	1	-	0	1	0	0	-	-	-	-	-	-	-
Miconia acuminata	0	0	0	2	1	0	1	0	0	2	0	0	-	-	1	3	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia aeruginosa	0	0	0	1	0	0	0&1	0	0	0	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia affinis	0&1	0	1	1	1	0&1	0	0&1	1	1	0	0	-	-	1	2	0	2	0	1	1	0	1	0	0	-	0	0	-	1	2	0	1	1	0	-	-
Miconia alata	0	0	1	1	1	0	0	0	6	1	0	1	0	0&2	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia albicans	0	0	1	2	1	0	1	0	0	2	0	0	-	-	1	1	1	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Miconia aliquantula	0	0	1	0	0	0	0	0	0&1	0	0	1	1	0&1	1	7	0	1&3	0	1	1	0	2	0	0	-	0	0	-	1	5	1	1	1	1	0	1
Miconia amplinodis	0	0	0	1	1	0	0	0	0	1	0	0	-	-	1	3	1	-	0	0	0	-	?	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia anderssonii	1	0	-	1	0	1	0	1	0	3	1	0	-	-	1	7	1	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia arboricola	0	0	0	1	0	0	1	2	2&3	1	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia argentea	0	0	1	1	1	0	0&1	0	5	2	0	1	0	0&1	0	-	-	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia argyrophylla	0	0	1	2	2	0	0	0&2	0	2	0	0	-	-	0	-	-	-	0	1	1	1	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia asclepiadea	0	0	0	0	0	0	0	0	0	2	0	0	-	-	1	1	1	-	0	1	1	0	0&2	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia astroplocama	0	0	0	2	1	0	0	0	0&3	0	0	1	0	0	1	2&4	0	2	0	0	1	1	-	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia aymardii	0	0	0	1	0	0	0	0&2	0	2	0	0	-	-	0	-	-	-	1	1	1	0	0&3	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia benthamiana	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	4	1	-	0	1	1	0	0&1	0	0	-	0	0	-	1	4	0	0	-	1	1	-
Miconia biperulifera	0	0	0	2	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia brachybotrya	0	0	0	1	0	0	1	0	0	1	0	0	-	-	1	4	1	-	0	0	1	0	0&1	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia bracteolata	0	0	0	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	0	1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia brevitheca	0	0	0	0	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	1	-	0	0	0	-	0	-	-	-	-	-	-	-
Miconia brunnea	0	0	0	3	3	0	1	0	0&2	2	0	0	-	-	0	-	-	-	0	1	1	0	0	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia bubalina	0	0	0	1	0	0	0	0&2	0&3	1	0	0	-	-	1	6	1	-	0	1	1	0	1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia bullata	0	0	0	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	1&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia calvescens	0	0	0	1	0	0	0	0	3	1	1	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia calycina	0	0	1	1	0	0	0	0	0&1	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia campestris	0	0	0	1	0	0	0	2	0&3	0	0	0	-	-	0	-	-	-	0	0	1	0	0	1	-	1	0	1	0	0	-	-	-	-	-	-	-
Miconia caudigera	0	0	0	3	3	0	1	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia centrodesma	1	0	-	1	0	0&1	0	0	6	0	0	1	0	1	1	4	0	3	0	1	1	0	0&1	1	-	0	0	0	-	1	1	1	1	1	1	2	-
Miconia cercophora	1	0	-	1	0	1	0	1	1	1	0	0	-	-	1	7	0	1&3	0	1	1	0	1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Miconia chartacea	2	0	0	3	3	2	1	2&4	2	0	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia chionophila	0	0	1	1	1	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0&1	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia chrysophylla	0	0	0	3	2	0	1	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia cinerascens	0	0	0	2	2	0	1	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Miconia costaricensis	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia crassinervia	0	0	1	2	1	0	0	0&1	0&1	2	0	0	-	-	0	-	-	-	0	1	1	0&1	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia cubensis	0	0	1	1	0	0	0	0	0	1	0	0	-	-	1	7	0	3	1	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia cuspidata	0	0	1	2	1	0	0	0	0&1	2	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia denticulata	0	0	1	0	0	0	0	0	0	1	0	0	-	-	1	1&7	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Miconia desportesii	0	0	1	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia dielsiana	0	0	0	1	0	0	0	0	0&5	1	0	1	0	0&2	0	-	-	-	1	1	1	0&1	0&2	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia dispar	0&1	0	1	2	1	0	0	0&1	0&1	1	0	1	0	0&2	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia dodecandra	1	0	-	2	1	1	0	0&1	0	1	0	0	-	-	1	5&7	0	2	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia dolichopoda	0	0	0	2	1	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia dolichorrhyncha	0	0	1	2	2	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Miconia donaeana	1	0	-	1	0	1	0	1	1	1	0	0	-	-	1	7	1	-	0	1	1	0	0	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia duckei	0	0	1	0	0	0	0	0&2	0&3	1	0	1	0	1	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	1	2&5	0	0	-	1	0	1
Miconia elata	0	0	1	2	2	0	0	0	0	1	0	0	-	-	1	0	1	-	0	1	1	0	0&1&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia ernstii	0	0	0	2	2	0	1	2	0	0	0	0	-	-	1	2	1	-	0	1	1	0&1	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia ferruginea	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0&1	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia foveolata	0	0	1	1	0	0	0	0	0	2	0	0	-	-	1	7	0	1	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia friedmaniorum	0&1	0	1	1	0	0&1	0	0&1	0&1	1	0	1	0	0	0	-	-	-	0	1	2	0	0	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia furfuracea	1	0	-	2	1	1	0	0&3	3&5	1	0	0	-	-	1	2&7	1	-	0	1	1	0&1	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia glandulifera	0&1	0	1	1	0	0&1	0	0	0	0	0	0	-	-	1	7	0	1	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia globuliflora	0	0	0	1	0	0	0	0	0	0	1	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia gratissima	0	0	1	2	0	0	0	0&1	1&5	1	0	1	0	0	1	7	1	-	0	1	2	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia harlingii	0	0	0	2	1	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia hemenostigma	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia holosericea	0	0	0	2	1	0	0	0&2	2&3	1	0	0	-	-	1	3	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia hookeriana	0	0	0	1	0	0	0&1	0&2	0&3	2	0	0	-	-	1	2	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia hyemalis	0	0	0	3	2	?	1	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia hypoleuca	1	0	-	1	0	1	0	1	1	2	0	0	-	-	1	7	0	3	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia ibaguensis	1	0	-	1	0	1	0	0&1	0&5	2	0	0	-	-	1	7	1	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia inconspicua	0	0	0	2	1	?	1	0&2	0	2	0	0	-	-	0	-	-	-	0	0	1	1	-	1	-	0	1	0	-	0	-	-	-	-	-	-	-
Miconia jahnii	0	0	0	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia jucunda	0	0	1	2	1	0&1	0	0	0	2	0	1	0	1	0	-	-	-	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia krugii	0	0	1	1	0	0	0	0	3	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia labiakana	0	0	0	1	0	0	0	0&3	5	2	0	0	-	-	0	-	-	-	1	0	1	0	0&1	1	-	0	0	0	-	0	-	-	-	-	-	-	-
Miconia lacera	0	0	0	0	0	0	1	0	3&6	1	1	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia laevigata	0	0	0	1	0	0	0	0	3	1	0	0	-	-	1	2	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia lanceolata	0	0	1	2	1	0	0	0&2	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0&2	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Miconia latecrenata	0	0	0	1	1	0	1	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1&2	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia latifolia	0	0	1	1	0	0	0	0	0	1	0	0	-	-	1	4	1	-	1	0	1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Miconia leiotricha	0	0	1	1	0	0	0	0	0	1	1	0	-	-	0	-	-	-	0	1	1	0&1	2	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia lepidota	0	0	1	2	2	0	1	0	0	2	0	0	-	-	1	2	1	-	0	0	1	0&1	0&1	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Miconia ligulata	0	0	1	0	0	0&1	0	0	0	1	0	1	0	0	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	1	1	2	0	0	-	1	1	-
Miconia ligustrina	0	0	1	2	1	0	0	0&3	0	1	1	0	-	-	0	-	-	-	0	1	1	0&1	0&2	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia livida	0	0	1	1	0	0	0	0	0	2	1	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia lonchophylla	0	0	1	2	2	0	0&1	0	0	2	0	0	-	-	1	0	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia longicuspis	0	0	0	3	3	0	1	0&4	0	2	0	0	-	-	0	-	-	-	0	0	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia longispicata	0	0	1	2	2	0	0	0	0	2	0	0	-	-	0	-	-	-	0	0	1	0	0&1	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia loreyoides	0	0	1	1	0	0	0	0	0	2	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia luteola	0	0	1	2	1	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia lymanii	0	0	0	3	2	0	1	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia macrodon	0	0	0	1	0	0	1	0	3	1	1	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia magdalenae	0	0	0	1	1	0	1	0	0	1	0	1	0	0	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia manicata	0	0	0	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia marginata	0	0	1	0	0	0	0&1	0	0	1	0	0	-	-	0	-	-	-	0	?	0	-	-	0	0	-	0	1	1	1	2	0	0	-	1	1	-
Miconia melanotricha	0	0	0	1	0	0	1	0&2	0&6	1	0	0	-	-	1	2	1	-	0	1	2	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia meridensis	0	0	1	1	0	0	0	0	0	2	0	0	-	-	1	1&7	1	-	0	0&1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia molybdea	0	0	0	1	0	0	0	0	3&6	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia multiplinervia	0	0	1	1	0	0	0	0&3	0	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia multispicata	1	0	-	2	2	0&1	0	0&1	0&5	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia nervosa	0&1	0	1	1	0	0&1	0	0&1	0	1	0	0	-	-	1	7	0	1&3	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia nitidissima	0	0	1	2	1	0	0	0	0	2	0	1	0	0&1	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia nystroemii	0	0	1	1	0	0&1	0	0	0	1	0	0	-	-	1	4	0	2	0	1	1	0&1	0	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia octopetala	0	0	1	3	3	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia oldemanii	1	0	-	1	1	1	0	0&3	0&3	1	0	0	-	-	1	2	1	-	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia pachyphylla	0	0	1	2	2	0	0	0	0	1	0	1	0	1	0	-	-	-	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia papillosa	0	0	0	1	0	0	0	0	3	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia paradoxa	0	0	1	2	2	0	0	0	0	1	0	1	0	1	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia phanerostila	0	0	1	3	2	0	0	0&2	0	1	0	0	-	-	1	7	0	1	0	1	1	0	0	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia poeppigii	1	0	-	2	1	1	0	0&1	1	2	0	1	0	0&1	1	2	0	0&3	0	1	1	0&1	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia polyandra	0	0	1	2	1	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia polygama	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	7	0	3	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia prasina	1	0	-	2	0	1	0	0&1	1	1	0	1	0	0&1	1	7	0	3	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia procumbens	0	0	0	1	0	0	0	0	0	0	0	1	2	1	1	7	0	3	0	1	1	0	0	2	-	-	0	1	1	1	5	0	1	0	1	0	0

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Miconia pubipetala	1	0	-	2	1	1	0	1&3	1	1	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia pulvinata	0	0	1	1	0	0	0	0	3&6	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia punctata	0	0	1	3	2	0	1	0&2	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Miconia pusilliflora	0	0	0	3	2	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia pyramidalis	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	2	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia ramboi	0	0	1	2	1	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Miconia reducens	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	2	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia rimalis	0	0	0	2	2	0	1	0	0	1	0	0	-	-	1	0	0	0	0	1	2	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia rosea	0	0	1	1	0	0	0	0	6	0	1	0	-	-	1	1&7	0	2&3	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia rubiginosa	0	0	1	2	1	0	0	0&2	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia rufescens	0	0	1	1	1	0	0	0&2	0&5	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia rugosa	1	0	-	2	1	1	0	0	0	1	0	0	-	-	1	7	0	1	0	1	1	0&1	0	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia samanensis	0	0	1	1	0	0	0	0	0	1	0	0	-	-	1	4	0	2&3	0	0	1	1	-	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia sanctiphilippi	1	0	-	1	1	1	0	1&3	3&5	2	1	0	-	-	1	2	0	1	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia schlimii	0	0	1	1	0	0&1	0	0&3	5	2	0	0	-	-	1	2&7	0	1&2 &3	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia schnellii	0	0	0	1	1	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia sclerophylla	0	0	0	2	2	0	1	0&4	2	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia selleana	0	0	1	1	1	0	0	0	5	2	0	0	-	-	0	-	-	-	0	1	1	1	0	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia sellowiana	0	0	0	2	2	0	0	0	0	2	0	0	-	-	1	0	0	0	0	1	2	0	0	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia septentrionalis	0	0	1	1	0	0	0	0	0&5	1	0	0	-	-	1	1&7	0	0&2	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia serrulata	0	0	0	1	0	0	0	0&2	0	1	0	0	-	-	1	6	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia sessilifolia	0	0	0	1	0	0	0&1	0&2	0&3	2	0	0	-	-	0	-	-	-	1	1	1	0	0	1	-	0	0	1	0	0	-	-	-	-	-	-	-
Miconia sintenisii	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	1	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia skeaniana	0	0	1	1	0	0	0	0&3	0	1	0	0	-	-	1	7	0	1&3	0	1	1	0	0&1 &2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia smaragdina	1	0	-	1	0	0&1	0	0&1	1	1	0	0	-	-	1	2	0	3	0	1	1	0	0	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia sphagnicola	0	0	1	1	1	0	0	0	0	1	0	0	-	-	1	4	1	-	1	0	1	1	-	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Miconia splendens	0	0	1	2	1	0	0	0&1	0&1	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia stenobotrys	0	0	1	2	1	0	0&1	0&3	5	1	0	0	-	-	1	2	0	3	0	1	1	0&1	0	0	0	-	0	0	-	1	0	0	1	0	0	-	-
Miconia stenostachya	0&1	0	1	2	1	0&1	0&1	0	0&5	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia subcompressa	0	0	1	1	0	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia superba	0	0	1	2	1	0&1	0	0	0	1	0	1	0	0&2	1	1	0	1&2	0	1	1	0	0&1	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Miconia sylvatica	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	2	1	-	0	1	1	0	1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia tetrandra	0	0	1	2	1	0&1	0	0	0	1	0	1	0	1	1	0&7	1	-	0	1	1	0	1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia tetrastoma	0	0	0	1	0	0	1	0	0	1	0	0	-	-	1	4	1	-	0	1	1	0	0&1	1	-	0	0	0	-	0	-	-	-	-	-	-	-
Miconia theizans	0	0	0	1	0	0	0	0	0&6	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1 &2	0	1	-	0	0	-	0	-	-	-	-	-	-	-

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APPENDIX I. (Continued)

Species/character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Miconia thomasiana	0	0	1	2	2	0	0	0	0&1	2	0	1	0	1	0	-	-	-	0	1	1	0	1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Miconia tomentosa	1	0	-	2	1	1	0&1	3	5	1	0	0	-	-	1	2	1	-	0	1	1	0&1	0&1 &2	0	0	-	1	0	-	0	-	-	-	-	-	-	-
Miconia tonduzii	0	0	0	1	0	0	0	0	0	0	0	0	-	-	0	-	-	-	0	1	1	0	0&2	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Miconia trianae	0	0	0	2	1	0	0	0	0	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	2	-	-	0	0	-	0	-	-	-	-	-	-	-
Miconia triangularis	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	1	1	-	0	1	1	0	0	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia trimera	0	0	0	0	0	0	1	0	0&3	2	0	1	0	1	1	6	1	-	0	1	1	0	1	0	0	-	0	1	0	1	5	0	1	1	0	-	-
Miconia triplinervis	0	0	0	0	0	0	0	0	3&6	0	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Miconia tuberculata	0	0	0	0	0	0	0	0	0	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia undata	0	0	1	1	0	0	0	0	0	1	0	0	-	-	1	7	0	1	0	1	1	0	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia valtheri	0	0	1	2	1	0	1	0&2	0&3	1	0	0	-	-	0	-	-	-	0	1	1	0	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia viscidula	0&1	0	1	2	0	0&1	0	0	7	1	0	1	0	1	1	7	0	1&3	0	1	1	0&1	2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Miconia willdenowii	0	0	0	3	3	0	0	0	0	1	0	0	-	-	1	2	1	-	0	0	1	1	?	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Necramium gigantophyllum	0	0	0	1	0	0	0	0	0	2	0	0	-	-	1	7	0	1	1	0	1	0	0&1	1	-	0	1	0	-	0	-	-	-	-	-	-	-
Ossaea brenesii	0	0	1	0	0	0	0	0	0	2	1	0	-	-	1	7	0	3	0	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Ossaea capillaris	0	0	0	0	0	0	0	0	3&6	1	0	0	-	-	0	-	-	-	1	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Ossaea macrophylla	1	0	-	0	0	1	0	1	5	1	0	0	-	-	0	-	-	-	0	1	1	0	0&2	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Ossaea micrantha	0	0	1	0	0	0	0	0	0	2	1	0	-	-	1	7	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Ossaea quadrisulca	0	0	0	0	0	0	0&1	0&2	2	0	0	0	-	-	0	-	-	-	1	0	1	0	0&1	1	-	0	0	1	2	0	-	-	-	-	-	-	-
Ossaea robusta	0	0	1	0	0	0	0	0&3	5	1	0	0	-	-	1	7	0	3	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Ossaea spicata	1	0	-	0	0	1	0	0	5	2	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Pachyanthus lundellianus	0	0	1	1	0	0	0	0	0	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	1	1	0	-	-	-	-	-	-	-
Sagraea fuertesii	0	0	0	1	0	0	0	0	0	1	0	0	-	-	1	7	0	1	1	0	1	0	1	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Sagraea scalpta	0	0	1	1	0	0	0	0	3&5	1	0	1	0	0&1	1	7	0	3	1	0	1	0	0&1	1	-	0	0	0	-	1	0&5	0	0	-	1	0	1
Tetrazygia elaeagnoides	1	0	-	2	0	1	0	1	5	1	0	0	-	-	0	-	-	-	0	1	1	0	0&1	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Tetrazygia urbaniana	0	0	0	1	0	0	0	0	0&5	1	0	0	-	-	1	7	0	3	0	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Tococa caquetana	1	0	-	0	0	1	0	0&1	5	1	0	1	0	1	1	7	0	1&3	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Tococa macrophysca	0	0	0	2	1	0	0	0	0&3	2	1	0	-	-	1	7	0	1	1	1	1	1	?	0	1	-	0	0	-	0	-	-	-	-	-	-	-
Tococa nitens	0	0	1	2	1	0	0&1	0&2	0&3	2	0	0	-	-	1	7	0	1	0	0	1	0&1	0&2	0	0	-	0	0	-	0	-	-	-	-	-	-	-
Tococa perclara	0	0	0	1	0	0	1	0&2	0&3	1	0	0	-	-	1	1	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Tococa platyphylla	0	0	0	1	0	0	0&1	0	0	2	0	0	-	-	1	5	1	-	0	1	1	0	0&1	0	0	-	0	1	2	0	-	-	-	-	-	-	-
Tococa quadrialata	0	0	1	1	1	0	0	0	0	1	0	0	-	-	1	4	0	2	1	0	1	0&1	0&1	1	-	1	0	0	-	0	-	-	-	-	-	-	-
Tococa rotundifolia	0	0	0	3	2	0	0	0&2	0&3	2	0	0	-	-	1	7	1	-	0	0	1	0	0&1	2	-	-	0	1	1	0	-	-	-	-	-	-	-
Tococa spadiciflora	0	0	1	0	0	0&1	0	0	6	1	0	0	-	-	0	-	-	-	1	1	1	0	0&1	0	0	-	0	1	0	0	-	-	-	-	-	-	-
Tococa subciliata	0	0	1	3	1	0	0	0	0&5	2	0	0	-	-	0	-	-	-	1	1	1	1	?	1	-	1	0	1	0	0	-	-	-	-	-	-	-

APPENDIX II. Seed descriptions. Species are arranged in alphabetical order, followed by figure number, voucher specimen information [country where the specimen was collected, collector's number (s.n. = without number), and herbarium code in parentheses], and description.

Anaectocalyx bracteosa (Naudin) Triana ex Cogn.

Figures 7A–B, Venezuela, *Dorr & Barnett 7563* (CAS).

Seed ovoid, angled, 0.63–0.75 mm long, ca. 0.35 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a reticulate pattern found on the micropylar side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Calycogonium glabratum (Sw.) DC.

Figures 7C–D, Cuba, *Michelangeli et al. 1478* (CAS).

Seed pyramidal, 0.61–0.73 mm long, 0.31–0.4 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, nearly as long as the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, nearly flat, occasionally with punctate microrelief.

Charianthus alpinus (Sw.) R.A.Howard

Figures 7E–F, Dominica, *Wilbur et al. 7788* (CAS).

Seed ovoid to pyramidal, 0.64–0.88 mm long, 0.39–0.44 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone narrowly ovate to linear, nearly as long as the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern on the micropylar side and lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- type pattern; periclinal walls convex, low-domed to nearly flat.

Charianthus dominicensis Penneys & Judd

Figures 7G–H, Dominica, *Wilbur et al. 8080* (CAS).

Seed ovoid to pyramidal, 0.71–0.86 mm long, 0.33–0.37 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone suboblong, as long as the seed. Appendage ca. 10% the length of the seed, forming a right to obtuse angle. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Charianthus nodosus (Desr.) Triana

Figures 8A–B, Martinique, *Penneys 1275* (FLAS).

Seed ovoid, angled, 0.68–0.73 mm long, 0.34–0.41 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone triangular to suboblong, nearly as long as the seed. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Charianthus purpureus D.Don

Figures 8C–D, Montserrat, *Howard et al. 18968* (NY).

Seed ovoid to pyramidal, 0.72–0.81 mm long, 0.3–0.42 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate to suboblong, nearly as long as the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Clidemia capitata Benth.

Figures 8E–F, Venezuela, *Maguire 32682* (NY). Photo: Katie Huish.

Seed ovoid, sometimes angled, ca. 1 mm long, ca. 0.55 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells usually arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns, sometimes inconspicuous; periclinal walls convex, high-domed.

Clidemia caudata Wurdack

Figures 8G–H, Colombia, *Restrepo & Matapi 520* (NY).

Seed pyramidal, 0.57–0.71 mm long, 0.25–0.36 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone triangular, ca. 80–90% the length of the seed. Appendage present, ca. 30 % the length of the seed, forming a right angle. Multicellular sculpture an oblong net pattern found on the lateral faces and antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief punctate.

Clidemia charadrophylla Tutin

Figures 9A–B, Guyana, *Hoffman & Henkel 3292* (NY).

Seed narrowly pyramidal, 0.51–0.56 mm long, 0.2–0.26 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side. Raphal zone triangular, ca. 80% the length of the seed. Appendage present, ca. 20 % the length of the seed, forming an obtuse or right angle. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to almost flat, microrelief minutely verrucose.

Clidemia ciliata Pav. ex D.Don

Figures 9C–D, Bolivia, *Bang 448* (NY). Photo: Katie Huish.

Seed ovoid, 0.55–0.76 mm long, 0.34–0.47 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed, usually dividing into several segments.

Clidemia clandestina Almeda

Figures 9E–F, Panama, *Knapp et al. 6008* (CAS).

Seed ovoid, usually angled, 0.93–1 mm long, ca. 0.57 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Multicellular sculpture a

rugose pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Clidemia crenulata Gleason

Figures 9G–H, Panama, *Croat 22999* (NY). Photo: Katie Huish.

Seed ovoid, angled, 0.54–0.68 mm long, 0.38–0.41 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls, par-conical, microrelief punctate; frequently the cells of the lateral faces with convex, high-domed periclinal walls.

Clidemia debilis Crueg.

Figures 10A–B, Brazil, *Silva et al. 59* (NY). Photo: Katie Huish.

Seed ovoid, ca. 0.7 mm long, 0.29–0.33 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with inconspicuous U-type pattern; periclinal walls convex, high-domed, very often dividing into several segments.

Clidemia densiflora (Standl.) Gleason

Figures 10C–D, Ecuador, *Asplund 19602* (US). Photo: Katie Huish.

Seed pyramidal, 0.52–0.57 mm long, ca. 0.4 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane suboblong. Raphal zone suboblong, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, nearly flat, microrelief striate.

Clidemia discolor (Triana) Cogn.

Figures 10E–F, Colombia, *Zarucchi 3307* (NY). Photo: Katie Huish.

Seed ovoid, 0.23–0.29 mm long, 0.12–0.17 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70–80% the length of the seed. Multicellular sculpture an inconspicuous reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief striate.

Clidemia domingensis (DC.) Cogn.

Figures 10G–H, Dominican Republic, *Liogier 13185* (NY).

Seed ovoid, 0.45–0.53 mm long, 0.28–0.32 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone ovate, as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with inconspicuous U-type pattern; periclinal walls convex, high-domed, often dividing into two or more segments.

Clidemia fendleri Cogn.

Figures 11A–B, Venezuela, *Liesner 8331* (NY). Photo: Katie Huish.

Seed ovoid, sometimes angled, 0.54–0.68 mm long, 0.37–0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Appendage absent, but sometimes a small protuberance is present. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed, sometimes dividing into two or more segments.

Clidemia fraterna Gleason

Figures 11C–D, Panama, *Knapp 1572* (CAS).

Seed pyramidal, 0.37–0.52 mm long, 0.19–0.25 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate to triangular, as long as the seed. Appendage absent, but sometimes a minute protuberance is present. Multicellular sculpture an oblong net pattern found on the antiraphal side. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with short Ω- and U-type patterns; periclinal walls convex, high-domed.

Clidemia garciabarrigae Wurdack

Figures 11E–F, Panama, *Valdespino et al. 596* (CAS).

Seed ovoid, frequently angled toward the micropylar side, 0.74–0.98 mm long, 0.32–0.56 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to elliptic, ca. 60% the length of the seed. Multicellular sculpture a rugose pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls low-domed to nearly flat.

Clidemia globuliflora (Cogn.) L.O.Williams

Figures 11G–H, Costa Rica, *Burger & Liesner 6761* (NY).

Seed ovoid, 0.49–0.63 mm long, 0.29–0.39 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70–80% the length of the seed. Appendage absent, but sometimes a minute protuberance is present. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed.

Clidemia heptamera Wurdack

Figures 12A–B, Venezuela, *Steyermark 89403* (NY). Photo: Katie Huish.

Seed ovoid, sometimes angled, 0.47–0.66 mm long, 0.34–0.42 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone suboblong, ca. 70–80% the length of the seed. Appendage present, ca. 25% the length of the seed, forming a right to obtuse angle. Multicellular sculpture a crateriform pattern found on the chalazal side. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed;the cells of the appendage isodiametric, anticlinal boundaries apparently irregularly curved, periclinal walls convex, high-domed.

Clidemia inobsepta Wurdack

Figures 12C–D, Ecuador, *Asplund 19763* (NY). Photo: Katie Huish.

Seed ovoid, 0.39–0.42 mm long, ca. 0.29 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone ovate, nearly as long as the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief striate.

Clidemia monantha L.O.Williams

Figures 12E–F, Panama, *Antonio 1718* (CAS).

Seed ovoid, 0.46–0.61 mm long, 0.31–0.35 mm wide; lateral symmetrical plane widely ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, 70–80% the length of the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed, usually dividing into two or more segments.

Clidemia octona (Bonpl.) L.O.Williams

Figures 12G–H, Mexico, *Ventura 12898* (CAS).

Seed ovoid, 0.39–0.48 mm long, 0.2–0.28 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Clidemia pittieri Gleason

Figures 13A–B, Panama, *Quiroz 800* (NY). Photo: Katie Huish.

Seed ovoid, angled, ca. 0.51 mm long, 0.35–0.56 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Clidemia pustulata DC.

Figures 13C–D, Guyana, *Clarke et al. 6496* (CAS).

Seed ovoid, 0.41–0.47 mm long, 0.2–0.24 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 60–70% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed, microrelief striate.

Clidemia quinquenervia (Mill.) Almeda

Figures 13E–F, Costa Rica, *Utley 6048* (CAS).

Seed ovoid, angled 0.41–0.54 mm long, 0.16–0.2 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone suboblong, ca. 10–20% larger than the corpus of the seed, ventrally expanded and longitudinally expanding toward the micropylar side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Clidemia reitziana Cogn. & Gleason

Figures 13G–H, Costa Rica, *Hammel 8880* (US).

Seed ovoid, angled, 0.33–0.61 mm long, 0.12–0.2 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone suboblong, ca. 60% larger than the corpus of the seed, ventrally and longitudinally expanded. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries

channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Clidemia rubra (Aubl.) Mart.

Figures 14A–B, Belize, *Gentle 1816* (NY). Photo: Katie Huish.

Seed ovoid, 0.57–0.67 mm long, ca. 0.34 mm wide; lateral symmetrical plane widely ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a reticulate pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed, often dividing into two or more segments.

Clidemia setosa (Triana) Gleason

Figures 14C–D, Guatemala, *Martínez et al. 22895* (CAS).

Seed ovoid, 0.4–0.5 mm long, 0.26–0.37 mm wide; lateral symmetrical plane widely ovate, the highest point near the central part of the seed; antiraphal symmetrical plane elliptic. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed.

Clidemia tenebrosa Almeda

Figures 14E–F, Panama, *Penneys & Blanco 1753* (NY).

Seed ovoid, 0.32–0.44 mm long, 0.12–0.21 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture a reticulate pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed, nearly flat, microrelief verrucose.

Clidemia umbellata (Mill.) L.O.Williams

Figures 14G–H, Dominican Republic, *Burch & Jiménez 2495* (CAS).

Seed ovoid, 0.36–0.43 mm long, 0.2–0.27 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80–90% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed, microrelief striate.

Clidemia umbrosa (Sw.) Cogn.

Figures 15A–B, Guadalupe, *Martin 485* (NY). Photo: Claire Martin.

Seed ovoid, ca. 0.33 mm long, ca. 0.2 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Multicellular sculpture a crateriform pattern throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief finely striate; the cells of the appendage apparently with irregularly curved anticlinal boundaries, periclinal walls high-domed.

Conostegia bigibbosa Cogn.

Figures 15C–D, Costa Rica, *Almeda et al. 4275* (CAS).

Seed narrowly ovoid, 0.49–0.57 mm long, ca. 0.2 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane narrowly elliptic. Raphal zone narrowly ovate, ca. 70–80% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, high-domed.

Conostegia centronioides Markgr.

Figures 15E–F, Ecuador, *Little 6215* (NY). Photo: Katie Huish.

Seed ovoid, angled, ca. 0.4 mm long, ca. 0.25 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone suboblong, 90% the length of the seed. Appendage absent, but sometimes a small protuberance is present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, occasionally dividing into several segments.

Conostegia lasiopoda Benth.

Figures 15G–H, Costa Rica, *Croat 68155* (CAS).

Seed ovoid, 0.27–0.37 mm long, 0.12–0.17 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70–80% the length of the seed. Multicellular sculpture a reticulate pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat; some of the cells on the chalazal side with par-convex, par-domed periclinal walls.

Conostegia macrantha O.Berg ex Triana

Figures 16A–B, Panama, *Penneys & Olmos 1738* (CAS).

Seed narrowly ovoid, 0.48–0.59 mm long, 0.24–0.3 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U- and V-type patterns; periclinal walls convex, low-domed to nearly flat.

Conostegia micrantha Standl.

Figures 16C–D, Costa Rica, *Proctor 32142* (CAS).

Seed ovoid, 0.44–0.55 mm long, 0.17–0.24 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70–80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, often dividing into several segments.

Conostegia oerstediana O.Berg ex Triana

Figures 16E–F, Panama, *Cowan & Murillo 4526* (CAS).

Seed narrowly ovoid, 0.63–0.79 mm long, 0.24–0.34 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 75% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, high-domed.

Conostegia speciosa Naudin

Figures 16G–H, Panama, *Kennedy & Redemsky-Young 1808* (NY). Photo: Katie Huish.

Seed ovoid, its base horizontally expanded, angled, 1.12–1.21 mm long, 0.76–0.79 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed.

Conostegia subcrustulata (Beurl.) Triana

Figures 17A–B, Panama, *Dwyer 2240* (NY). Photo: Katie Huish.

Seed ovoid, its base horizontally expanded, angled, 1.061–1.17 mm long, 0.81–1 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Conostegia xalapensis (Bonpl.) D.Don ex DC.

Figures 17C–D, Mexico, *Miller & Campos 2945* (CAS).

Seed ovoid, its base horizontally expanded, angled, ca. 1 mm long, 0.6–0.78 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone triangular, as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Killipia verticalis N.Ruiz-R.

Figures 17E–F, Colombia, *Luteyn & Giraldó 12654* (CAS).

Seed ovoid, 0.38–0.43 mm long, ca. 0.24 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone obovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed.

Leandra agrestis (Aubl.) Raddi

Figures 17G–H, French Guiana, *Hahn 3603* (CAS).

Seed ovoid, 0.32–0.44 mm long, 0.21–0.31 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or the central part of the seed. Raphal zone widely ovate, ca. 60% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed, microrelief minutely verrucose.

Leandra dichotoma (Pav. ex D.Don) Cogn.

Figures 18A–B, Panama, *Knapp et al. 1736* (CAS).

Seed ovoid, 0.27–0.33 mm long, 0.19–0.23 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane elliptic. Raphal zone circular, ca. 70% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Leandra divaricata (Naudin) Cogn.

Figures 18C–D, Guyana, *Clarke 2504* (CAS).

Seed ovoid, 0.26–0.31 mm long, 0.2–0.23 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone nearly circular, ca. 60% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Leandra fallacissima Markgr.

Figures 18E–F, Brazil, *Boone 447* (CAS).

Seed ovoid to narrowly ovoid, sometimes angled, 0.83–1 mm long, 0.33–0.44 mm wide; lateral symmetrical plane ovate to narrowly ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane ovate to triangular. Raphal zone ovate, nearly as long as the seed. Appendage absent, but occasionally a small protuberance is present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed.

Leandra granatensis Gleason

Figures 18G–H, Panama, *Mendieta 9-34* (CAS).

Seed ovoid, 0.25–0.3 mm long, 0.19–0.23 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone circular, ca. 80% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Leandra longicoma Cogn.

Figures 19A–B, Ecuador, *Øllgaard et al. 35195* (CAS).

Seed ovoid, 0.27–0.31 mm long, 0.16–0.2 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone circular to widely elliptic, ca. 70% the length of the seed. Cells arranged in an aligned pattern. Individual cells usually isodiametric, some of them elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed.

Leandra macdanielii Wurdack

Figures 19C–D, Peru, *Vásquez & Criollo 1755* (CAS).

Seed ovoid, 0.25–0.33 mm long, 0.17–0.22 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to elliptic, ca. 60% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Leandra melanodesma (Naudin) Cogn.

Figures 19E–F, Mexico, *Martínez-Pérez & Espíritu 165* (CAS).

Seed ovoid, 0.34–0.47 mm long, ca. 0.24 mm wide; lateral and antiraphal symmetrical plane ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Leandra reversa (DC.) Cogn.

Figures 19G–H, Brazil, *Hatschbach & Guimarães 55280* (CAS).

Seed ovoid, 0.2–0.32 mm long, 0.17–0.22 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 60% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed.

Leandra rhamnifolia (Naudin) Cogn.

Figures 20A–B, Brazil, *Harley 17163* (CAS).

Seed ovoid, 0.29–0.38 mm long, 0.25–0.29 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone circular, ca. 60% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Leandra subulata Gleason

Figures 20C–D, Panama, *McPherson 9687* (CAS).

Seed ovoid, 0.71–0.79 mm long, 0.46–0.49 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed.

Maieta guianensis Aubl.

Figures 20E–F, Brazil, *Rickson B-49-85* (CAS).

Seed narrowly pyramidal, 0.5–0.68 mm long, 0.2–0.28 mm wide; lateral symmetrical plane narrowly triangular, the highest point toward the chalazal side; antiraphal symmetrical plane triangular to suboblong. Raphal zone narrowly obovate, ca. 80% the length of the seed. Multicellular sculpture a reticulate pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief striate; the cells on the angulations of the seed with high-domed periclinal walls.

Maieta poeppigii Mart. ex Cogn.

Figures 20G–H, Guyana, *Henkel & Williams 2167* (CAS).

Seed ovoid, angled, 0.47–0.59 mm long, 0.28–0.31 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone elliptic, ca. 75% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a reticulate pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat; the cells on the angulations with high-domed periclinal walls.

Mecranium acuminatum (DC.) Skean

Figures 21A–B, Dominican Republic, *Judd et al. 2954* (CAS).

Seed ovoid, 0.4–0.5 mm long, 0.26–0.3 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal

side or the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, inconspicuously undulate, with U-type pattern; periclinal walls convex, high-domed, microrelief verrucose.

Mecranium haemanthum Triana ex Cogn.

Figures 21C–D, Cuba, *Shafer 8423* (NY).

Seed ovoid, 0.35–0.48 mm long, 0.2–0.26 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed, microrelief verrucose.

Mecranium ovatum Cogn.

Figures 21E–F, Dominican Republic, *Judd et al. 5184* (CAS).

Seed narrowly ovoid, 0.53–0.61 mm long, 0.3–0.35 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate, 80–90% the length of the seed. Multicellular sculpture an oblong net pattern usually found on the micropylar side. Cells arranged in an aligned pattern. Individual cells elongated, ocassionally isodiametric, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls par-convex, par-domed, microrelief inconspicuously verrucose, above all on the undulations of the anticlinal walls.

Mecranium septentrionale Skean

Figures 21G–H, Dominican Republic, *Zanoni et al. 40598* (NY).

Seed ovoid, 0.54–0.67 mm long, 0.28–0.37 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture an oblong-net pattern found on the lateral and micropylar sides. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, high-domed, microrelief striate.

Miconia acuminata (Steud.) Naudin

Figures 22A–B, French Guiana, *Hahn 3531* (CAS).

Seed ovoid, 0.97–1 mm long, 0.66–0.77 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a ruminate pattern found throughout the seed. Cells arranged in an irregular pattern, almost always fused with each other, thus making individual cell features difficult to observe. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia aeruginosa Naudin

Figures 22C–D, Venezuela, *Licata et al. 732* (CAS).

Seed ovoid, 0.53–0.69 mm long, 0.27–0.34 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate, ca. 60% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia affinis DC.

Figures 22E–F, Mexico, *Martínez Calderón 102* (CAS).

Seed shape very variable, ovoid to pyramidal, 0.83–0.96 mm long, 0.53–0.66 mm wide; lateral and antiraphal symmetrical planes ovate to triangular, the highest point toward the chalazal side. Raphal zone triangular, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat; occasionally the cells on the angulations of the seed with anticlinal boundaries irregularly curved and undulate with S-type pattern.

Miconia alata (Aubl.) DC.

Figures 22G–H, Venezuela, *Picón 1111* (CAS).

Seed ovoid, sometimes angled, 0.87–1 mm long, 0.47–0.53 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone obovate, ca. 70–80% the length of the seed. Appendage usually present, ca. 25% the length of the seed, forming a right to acute angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed; the cells on the angulations have high-domed periclinal walls.

Miconia albicans (Sw.) Steud.

Figures 23A–B, Belize, *Nee et al. 46778* (CAS).

Seed widely ovoid, sometimes longitudinally incurved, 0.97–1.11 mm long, 0.65–0.83 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a reticulate pattern throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia aliquantula Wurdack

Figures 23C–D, French Guiana, *Hahn 3605* (CAS).

Seed ovoid, angled, 0.27–0.4 mm long, 0.18–0.23 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to triangular, ca. 60% the length of the seed. Appendage present, almost as long as the seed, forming a right to obtuse angle. Multicellular sculpture an oblong net pattern found on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed; the cells on the appendage isodiametric, anticlinal boundaries irregularly curved, periclinal walls convex, high-domed.

Miconia amplinodis Umaña & Almeda

Figures 23E–F, Costa Rica, *Umaña et al. 510* (CAS).

Seed ovoid, 0.74–0.88 mm long, 0.54–0.66 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a ruminate pattern found throughout the seed. Cells fused with each other, thus making individual cell features difficult to observe. Individual cell microrelief verrucose (?).

Miconia anderssonii Wurdack

Figures 23G–H, Ecuador, *Hitchcock 21188* (NY).

Seed narrowly pyramidal, longitudinally incurved, 0.62–0.81 mm long, 0.25–0.31 mm wide; lateral and antiraphal symmetrical planes narrowly triangular, the highest point toward the chalazal side. Raphal zone narrowly ovate, up to 20% larger than the corpus of the seed, ventrally expanded. Multicellular sculpture an oblong net pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia arboricola Almeda

Figures 24A–B, Costa Rica, *Grayum et al. 7779* (CAS).

Seed ovoid, 0.38–0.61 mm long, 0.38–0.44 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane elliptic. Raphal zone circular to elliptic, ca. 80–90% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia argentea (Sw.) DC.

Figures 24C–D, El Salvador, *Carballo 1133* (CAS).

Seed ovoid, angled, 0.65–0.92 mm long, 0.46–0.61 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone suboblong, nearly as long as the seed. Appendage present, ca. 20% the length of the seed, forming a right to obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia argyrophylla DC.

Figures 24E–F, Brazil, *Dick 27* (CAS).

Seed ovoid, usually angled, 1.34–1.5 mm long, 1–1.22 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone ovate to elliptic, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, irregularly curved although a few of them have inconspicuous S-type undulations; periclinal walls convex, low-domed.

Miconia asclepiadea Triana

Figures 24G–H, Ecuador, *Luteyn & Cotton 10890* (CAS).

Seed ovoid, 0.35–0.41 mm long, 0.25–0.29 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Miconia astroplocama Donn. Sm.

Figures 25A–B, Ecuador, *Brandbyge & Asanza 31987* (CAS).

Seed ovoid, 0.86–1.22 mm long, 0.51–0.61 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to elliptic, ca. 60% the length of the seed. Appendage present, ca. 30% the length of the seed, forming a right angle. Multicellular sculpture a rugose pattern found on the chalazal side, minutelly crateriform on the lateral faces. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, irregularly curved; periclinal walls convex, high-domed.

Miconia aymardii Wurdack

Figures 25C–D, Venezuela, *Capote et al. 829* (NY).

Seed narrowly ovoid, 0.5–0.64 mm long, 0.24–0.33 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U- and V-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia benthamiana Triana

Figures 25E–F, Panama, *Hernández et al. 746* (CAS).

Seed ovoid, 0.34–0.43 mm long, 0.21–0.25 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a crateriform pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, intermixed with cells with par-convex, par-domed periclinal walls.

Miconia biperulifera Cogn.

Figures 25G–H, Costa Rica, *Wilbur & Stone 10653* (CAS).

Seed ovoid, 0.78–1.24 mm long, 0.44–0.51 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed.

Miconia brachybotrya Triana

Figures 26A–B, Panama, *de Nevers et al. 8274A* (CAS).

Seed ovoid, 0.5–0.57 mm long, 0.39–0.51 mm wide; lateral and antiraphal symmetrical planes widely ovate, the highest point near the central part of the seed. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a crateriform pattern found throughout the seed. Cells arranged in an irregular pattern, fused with each other, thus making individual cell features difficult to observe. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed.

Miconia bracteolata (Bonpl.) DC.

Figures 26C–D, Ecuador, *Camp E-4176* (NY).

Seed ovoid, 0.58–0.72 mm long, 0.36–0.47 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, inconspicuously undulate, with U-type pattern; periclinal walls convex, high-domed, somewhat angled.

Miconia brevitheca Gleason

Figures 26E–F, Costa Rica, *Haber 829* (CAS).

Seed ovoid, 0.37–0.55 mm long, 0.23–0.34 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed.

Miconia brunnea DC.

Figures 26G–H, Brazil, *Goldenberg 455* (UPCB).

Seed widely ovoid, 4.39–4.66 mm long, 3.23–3.85 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate. Raphal zone ovate to circular, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls slightly concave.

Miconia bubalina (D.Don) Naudin

Figures 27A–B, Ecuador, *Palacios 4232* (CAS).

Seed ovoid, 0.64–0.84 mm long, 0.39–0.62 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 80% the length of the seed. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern, fused with each other, thus making individual cell features difficult to observe. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed, microrelief minutely verrucose.

Miconia bullata (Turcz.) Triana

Figures 27C–D, Ecuador, *Luteyn 13423* (CAS).

Seed narrowly ovoid, 0.69–0.92 mm long, ca. 0.34 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but sometimes a small protuberance is present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and S-type patterns; periclinal walls convex, low-domed.

Miconia calvescens DC.

Figures 27E–F, Bolivia, *Solomon 18426* (CAS).

Seed ovoid, 0.5–0.63 mm long, 0.26–0.38 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone elliptic, convex, ca. 80% the length of the seed, ventrally expanded toward the micropylar side. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia calycina Cogn.

Figures 27G–H, Puerto Rico, *Woodbury s.n.*, Mar 1968 (NY).

Seed ovoid, angled, 0.55–0.69 mm long, 0.28–0.34 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone narrowly ovate to triangular, 80% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed.

Miconia campestris (Benth.) Triana

Figures 28A–B, Guyana, *Mutchnick & Harmon 1217* (CAS).

Seed ovoid, 0.65–0.84 mm long, 0.35–0.38 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane elliptic. Raphal zone ovate to elliptic, ca. 50–60% the length of the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls par-convex, par-conical, microrelief striate.

Miconia caudigera DC.

Figures 28C–D, Brazil, *Harley et al. 26619* (CAS).

Seed widely ovoid, ca. 2 mm long, 1.89–2.17 mm wide; lateral symmetrical plane narrowly ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate. Raphal zone widely ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed.

Miconia centrodesma Naudin

Figures 28E–F, Belize, *Allen 15226* (CAS).

Seed pyramidal, 0.51–0.68 mm long, 0.21–0.26 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone obovate, ca. 50% the length of the seed. Appendage present, ca. 25% the length of the seed. Multicellular sculpture a crateriform pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed; the cells toward the chalazal side isodiametric, anticlinal boundaries irregularly curved, periclinal walls concave.

Miconia cercophora Wurdack

Figures 28G–H, Ecuador, *Hurtado & Mena 127* (CAS).

Seed narrowly pyramidal, 0.75–0.86 mm long, 0.33–0.4 mm wide; lateral symmetrical plane narrowly triangular, the highest point toward the chalazal side; antiraphal symmetrical plane triangular. Raphal zone triangular, ca. 80% the length of the seed. Appendage absent, but a protuberance may be present. Multicellular sculpture an oblong net pattern found on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief striate.

Miconia chartacea Triana

Figures 29A–B, Brazil, *Alvarenga & Curado 243* (CAS).

Seed subspheroid, 3.26–3.61 mm long, 3–3.22 mm wide; lateral symmetrical plane circular, the highest point toward the center of the seed; antiraphal symmetrical plane circular to widely elliptic. Raphal zone circular, ca. 50% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed, nearly flat.

Miconia chionophila Naudin

Figures 29C–D, Venezuela, *Quintero 126* (CAS).

Seed ovoid, angled, 0.61–0.98 mm long, 0.54–0.68 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal sidel side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with short Ω- and U-type patterns; periclinal walls convex, high-domed.

Miconia chrysophylla (Rich.) Urb.

Figures 29E–F, Guatemala, *Contreras 10171* (CAS).

Seed widely ovoid, ca. 2.5 mm long, ca. 1.6 mm wide; lateral symmetrical plane ovate, the highest point near the central

part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, 80–90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Miconia cinerascens Miq.

Figures 29G–H, Brazil, *Lindeman & Haas 4545* (NY). Photo: Katie Huish.

Seed widely ovoid, 1.37–1.55 mm long, 1.24–1.34 mm wide; lateral symmetrical plane narrowly ovate, the highest point near the chalaza; antiraphal symmetrical plane widely ovate. Raphal zone widely ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls slightly concave, microrelief punctate.

Miconia costaricensis Cogn.

Figures 30A–B, Mexico, *Hahn 634* (CAS).

Seed ovoid, angled, 0.56–0.68 mm long, 0.3–0.33 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia crassinervia Cogn.

Figures 30C–D, Guyana, *Clarke 4718* (CAS).

Seed ovoid, angled, ca. 1.2 mm long, ca. 1 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone ovate to triangular, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern; periclinal walls convex, low-domed.

Miconia cubensis (C.Wright ex Griseb.) C.Wright

Figures 30E–F, Cuba, *León & Clement 6505* (NY).

Seed ovoid, angled, 0.53–0.72 mm long, 0.29–0.36 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Multicellular sculpture an oblong-net pattern found on the antiraphal side. Cells arranged in an aligned pattern. Individual cells elongated, sometimes isodiametric, anticlinal boundaries channeled, undulate, with S- or U-type patterns; periclinal walls convex, low-domed.

Miconia cuspidata Naudin

Figures 30G–H, Brazil, *Heringer et al. 1707* (CAS).
Seed ovoid, angled, 1–1.19 mm long, 0.82–1.14 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate to triangular, nearly as long as the seed. Multicellular sculpture a rugulose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, microrelief inconspicuously punctate.

Miconia denticulata Naudin

Figures 31A–B, Peru, *Valencia 2342* (CAS).

Seed ovoid, angled, 0.39–0.54 mm long, 0.24–0.32 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70–80% the length of the seed. Multicellular sculpture an inconspicuous reticulate pattern found throughout the seed, occasionally an oblong-net pattern on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia desportesii Urb.

Figures 31C–D, Dominican Republic, *Liogier 18598* (NY).

Seed ovoid, sometimes angled, 0.85–1.09 mm long, 0.33–0.46 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed.

Miconia dielsiana Urb.

Figures 31E–F, Dominican Republic, *Judd et al. 8217* (NY).

Seed ovoid, 0.62–0.75 mm long, 0.36–0.48 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to suboblong, 80–90% the length of the seed. Appendage present, ca. 20% the length of the seed, forming a right to acute angle. Cells arranged in an arranged pattern. Individual cells elongated, sometimes isodiamteric, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern, sometimes short U-type undulations; periclinal walls convex, high-domed.

Miconia dispar Benth.

Figures 31G–H, Brazil, *Mori et al. 20124* (NY).

Seed ovoid to pyramidal, angled, 0.94–1.13 mm long, 0.56–0.7 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone ovate to triangular, 70–80% the length of the seed. Appendage present, 20–30 % the length of the seed, forming a right to acute angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia dodecandra (Desr.) Cogn.

Figures 32A–B, Brazil, *Pipoly et al. 6643* (CAS).

Seed narrowly pyramidal, 1.09–1.21 mm long, 0.49–0.59 mm wide; lateral symmetrical plane narrowly triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Multicellular sculpture an alveolate pattern found on the chalazal side, sometimes an oblong-net pattern on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Miconia dolichopoda Naudin

Figures 32C–D, Costa Rica, *Haber 11107* (CAS).

Seed ovoid, 1.25–1.54 mm long, 0.81–0.88 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia dolichorrhyncha Naudin

Figures 32E–F, Colombia, *Shepherd 309* (CAS).

Seed widely ovoid, sometimes angled, 1.38–1.6 mm long, 1–1.52 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls slightly concave, microrelief punctate.

Miconia donaeana Naudin

Figures 32G–H, Panama, *Croat 66326* (CAS).

Seed pyramidal, 0.88–1 mm long, 0.33–0.39 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side. Raphal zone triangular to ovate, 80–90% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Multicellular sculpture an oblong net pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Miconia duckei Cogn.

Figures 33A–B, Peru, *Rimachi 11362* (NY).

Seed ovoid, angled, 0.38–0.45 mm long, 0.16–0.2 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 70% the length of the seed. Appendage present, ca. 30% the length of the seed, forming an obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat; the cells on the appendage and angulations of the seed with high-domed periclinal walls.

Miconia elata (Sw.) DC.

Figures 33C–D, Mexico, *Orcutt 6655* (CAS).

Seed widely ovoid, angled, 1.34–1.42 mm long, 1.16–1.18 mm wide; lateral and antiraphal symmetrical planes widely ovate, the highest point toward the chalazal side. Raphal zone widely ovate, ca. 80–90% the length of the seed. Multicellular sculpture a rugulose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia ernstii Wurdack

Figures 33E–F, Dominica, *Lloyd 911* (NY).

Seed widely ovoid, 1.39–1.57 mm long, 0.92–1.22 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane elliptic. Raphal zone ovate, ca. 50–60% the length of the seed. Multicellular sculpture a rugulose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S- and U-type patterns; periclinal walls convex, low-domed.

Miconia ferruginea (Desr.) DC.

Figures 33G–H, Dominican Republic, *Judd et al. 8122* (NY).

Seed ovoid, sometimes angled, 0.61–0.74 mm long, 0.32–0.37 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but sometimes a small protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern; periclinal walls convex, low-domed.

Miconia foveolata Cogn.

Figures 34A–B, Puerto Rico, *Howard 16624* (CAS).

Seed ovoid, angled, 0.67–0.83 mm long, 0.33–0.46 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Multicellular sculpture an oblong-net pattern pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia friedmaniorum Almeda & Umaña

Figures 34C–D, Costa Rica, *Herrera 1465* (CAS).

Seed narrowly ovate to pyramidal, 0.41–0.62 mm long, 0.18–0.23 mm wide; lateral and antiraphal symmetrical planes narrowly ovate to triangular, the highest point toward the chalazal side. Raphal zone ovate to triangular, ca. 70–80% the length of the seed. Appendage present, ca. 20–30% the length of the seed, forming a right angle. Cells arranged in an irregular pattern, fused with each other and forming longitudinal patterns, thus making individual cell features difficult to observe. Individual cells elongated, anticlinal boundaries raised, undulate, with U-type pattern; periclinal walls slightly concave.

Miconia furfuracea (Vahl) Griseb.

Figures 34E–F, Dominica, *Wilbur et al. 8191* (NY).

Seed pyramidal, 1.23–1.37 mm long, 0.56–0.71 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone elliptic to suboblong, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a rugose pattern found throughout the seed, sometimes an oblong-net pattern is found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern; periclinal walls convex, low-domed.

Miconia glandulifera Cogn.

Figures 34G–H, Bolivia, *Nee et al. 55252* (NY).

Seed ovoid to pyramidal, 0.52–0.64 mm long, 0.23–0.29 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 60–70% the length of the seed. Multicellular sculpture an oblong-net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia globuliflora (Rich.) Cogn.

Figures 35A–B, Trinidad and Tobago, *Andrews 3-64* (NY).

Seed ovoid, 0.48–0.59 mm long, 0.24–0.31 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 60% the length of the seed, ventrally expanded toward the micropylar side. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia gratissima Benth. ex Triana

Figures 35C–D, Bolivia, *Arroyo et al. 748* (CAS).

Seed narrowly ovoid, angled, 1.16–1.47 mm long, 0.43–0.53 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane narrowly ovate to triangular. Raphal zone suboblong to triangular, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming a right angle. Multicellular sculpture an oblong net pattern found througout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries raised, undulate, with U-type pattern; periclinal walls convex, low-domed, nearly flat.

Miconia harlingii Wurdack

Figures 35E–F, Ecuador, *Betancourt 399* (NY).

Seed ovoid, 0.93–1.19 mm long, 0.53–0.7 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, nearly flat.

Miconia hemenostigma Naudin

Figures 35G–H, Mexico, *Breedlove & Almeda 59904* (CAS).

Seed ovoid, angled, 0.6–0.75 mm long, 0.3–0.33 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia holosericea (L.) DC.

Figures 36A–B, Brazil, *Ferreira et al. 8061* (CAS).

Seed ovoid, 1.14–1.5 mm long, 0.78–1 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone ovate to elliptic, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a ruminate pattern found throughout the seed. Cells fused with each other and forming longitudinal patterns, thus making individual cell features difficult to observe. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia hookeriana Triana

Figures 36C–D, Ecuador, *Bennet 3374* (CAS).

Seed ovoid, 0.55–0.72 mm long, 0.35–0.46 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 90% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia hyemalis A.St.-Hil. & Naudin

Figures 36E–F, Brazil, *Ribas & Nicolack 304* (CAS).

Seed widely ovoid, ca. 2.4 mm long, 1.67–1.8 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate to widely ovate, ca. 75% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia hypoleuca (Benth.) Triana

Figures 36G–H, Venezuela, *Ruíz 2893* (CAS).

Seed pyramidal, 0.55–0.64 mm long, 0.26–0.43 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side. Raphal zone triangular, ca. 90% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia ibaguensis (Bonpl.) Triana

Figures 37A–B, Bolivia, *Solomon 8553* (CAS).

Seed pyramidal, 0.76–0.88 mm long, 0.34–0.45 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone ovate to suboblong, ca. 90% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed.

Miconia inconspicua Miq.

Figures 37C–D, Brazil, *Serafin 35* (UPCB).

Seed widely ovoid, ca. 1.1 mm long, 0.8–0.9 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone widely ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, irregularly curved; periclinal walls par-convex, par-domed, the distal end slightly dividing into two or more segments.

Miconia jahnii Pittier

Figures 37E–F, Venezuela, *Ruiz-Terán & López-Figueiras 1684* (CAS).

Seed ovoid, ocassionally angled, 0.5–0.71 mm long, 0.35–0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω, S-, and U-type patterns; periclinal walls convex, low-domed.

Miconia jucunda (DC.) Triana

Figures 37G–H, Brazil, *Klein 958* (NY).

Seed narrowly ovoid, angled, 1.2–1.4 mm long, 0.65–0.7 mm wide; lateral symmetrical plane narrowly ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 90% the length of the seed. Appendage present, ca. 25% the length of the seed, forming an obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia krugii Cogn.

Figures 38A–B, Dominican Republic, *Zanoni et al. 20268* (NY).

Seed ovoid, angled, 0.8–1 mm long, 0.38–0.55 mm wide; lateral and antiraphal symmetrical plane ovate, the highest point toward the chalazal side. Raphal zone elliptic to ovate, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia labiakana R.Goldenb. & C.V.Martin

Figures 38C–D, Brazil, *Fontana 3033* (UPCB).

Seed ovoid, 0.68–0.82 mm long, 0.32–0.36 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone suboblong, 90% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed.

Miconia lacera (Bonpl.) Naudin

Figures 38E–F, Honduras, *Pineda 184* (CAS).

Seed ovoid, 0.34–0.45 mm long, 0.19–0.25 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone elliptic to obovate, ca. 80% the length of the seed, ventrally expanded toward the micropylar side. Multicellular sculpture a reticulate pattern found througout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Miconia laevigata (L.) DC.

Figures 38G–H, Dominica, *Whitefoord 7240* (CAS).

Seed ovoid, 0.78–1 mm long, ca. 0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone elliptic, ca. 70% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia lanceolata (Desr.) DC.

Figures 39A–B, Dominican Republic, *Judd et al. 8132* (NY).

Seed ovoid, angled, 0.86–1.15 mm long, 0.45–0.6 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls slightly concave, microrelief inconspicuously punctate.

Miconia latecrenata (DC.) Naudin

Figures 39C–D, Brazil, *Dombrowski 24955* (CAS).

Seed widely ovoid, 0.76–1.05 mm long, 0.53–0.8 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate to widely ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with Ω-, S-, and U-type patterns; periclinal walls convex, usually high-domed, sometimes low-domed.

Miconia latifolia (D.Don) Naudin

Figures 39E–F, Colombia, *Luteyn et al. 13009* (CAS).

Seed ovoid, angled, 0.62–0.9 mm long, 0.41–0.52 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Multicellular sculpture a craterifom pattern found throughout the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, high-domed.

Miconia leiotricha Wurdack

Figures 39G–H, Venezuela, *Steyermark & Huber 114258* (NY).

Seed ovoid, angled, 0.7–0.8 mm long, 0.28–0.37 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed, ventrally expanded. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern; periclinal walls slightly concave.

Miconia lepidota DC.

Figures 40A–B, Brazil, *Renner 888* (CAS).

Seed widely ovoid, angled, 1.14–1.4 mm long, 0.9–1.14 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate. Raphal zone ovate, as long as the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, sometimes elongated, anticlinal boundaries channeled, irregularly curved to undulate with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, occasionally dividing into two or more segments.

Miconia ligulata Almeda

Figures 40C–D, Panama, *Hammel 4453* (CAS).

Seed ovoid, angled, 0.38–0.47 mm long, 0.17–0.26 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 75% the length of the seed. Appendage present, ca. 30% the length of the seed, forming a right angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief punctate; the cells on the angulations of the seed with par-convex, par-domed periclinal walls.

Miconia ligustrina (Sm.) Triana

Figures 40E–F, Ecuador, *Moran et al. 58* (CAS).

Seed ovoid, angled, 1–1.6 mm long, 0.55–0.78 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone ovate, ca. 70–80% the length of the seed, ventrally expanded. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S- and U-type patterns; periclinal walls slightly concave.

Miconia livida Triana

Figures 40G–H, Guatemala, *Förther et al. 10408* (CAS).

Seed ovoid, angled, 0.6–0.68 mm long, 0.3–0.38 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed, ventrally expanded. Cells arranged in an

irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia lonchophylla Naudin

Figures 41A–B, Costa Rica, *Espinoza 1461* (CAS).

Seed widely ovoid, angled, 1.6–1.74 mm long, 1.14–1.36 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane widely ovate. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a rugulose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, nearly flat.

Miconia longicuspis Cogn.

Figures 41C–D, Brazil, *Kollmann 3115* (UPCB).

Seed widely ovoid, 2.8–3.17 mm long, ca. 2.8 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate to circular. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia longispicata Triana

Figures 41E–F, Brazil, *Cid et al. 1429* (CAS).

Seed ovoid, angled, 1.24–1.28 mm long, 0.98–1 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, inconspicuously undulate, with Ω- and U-type patterns; periclinal walls convex, high-domed.

Miconia loreyoides Triana

Figures 41G–H, Ecuador, *Zak 1280* (CAS).

Seed ovoid, sometimes angled, 0.68–0.78 mm long, 0.4–0.45 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief minutely verrucose.

Miconia luteola Cogn.

Figures 42A–B, Dominican Republic, *Smith 10191* (NY).

Seed ovoid, slightly angled, 0.94–1.24 mm long, 0.65–0.86 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia lymanii Wurdack

Figures 42C–D, Brazil, *Scheer 20* (UPCB).

Seed widely ovoid, ca. 2.5 mm long, 1.64–1.83 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls slightly concave.

Miconia macrodon (Naudin) Wurdack

Figures 42E–F, Venezuela, *Márquez 23* (CAS).

Seed ovoid, 0.42–0.56 mm long, 0.27–0.32 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone elliptic, 75% the length of the seed, ventrally expanded toward the micropylar side. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia magdalenae Triana

Figures 42G–H, Venezuela, *Davidse & González 21576* (CAS).

Seed ovoid, 0.6–0.7 mm long, 0.44–0.58 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate. Raphal zone ovate, ca. 70% the length of the seed. Appendage present, ca. 30% the length of the seed, forming a right angle. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief minutely verrucose.

Miconia manicata Cogn. & Gleason

Figures 43A–B, Ecuador, *Dorr & Valdespino 6362* (CAS).

Seed ovoid, 0.48–0.61 mm long, 0.3–0.32 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief minutely verrucose.

Miconia marginata Triana

Figures 43C–D, Guyana, *Henkel et al. 4523* (CAS).

Seed ovoid, angled, 0.41–0.46 mm long, 0.24–0.31 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate, ca. 80–90% the length of the seed. Appendage absent, but sometimes a protuberance may be present. Cells arranged in an irregular pattern, fused with each other, thus making individual cell features difficult to observe. Anticlinal boundaries inconspicuous; periclinal walls convex, low-domed to nearly flat, microrelief strongly punctate; the cells on and near the angles with par-convex, par-domed periclinal walls.

Miconia melanotricha (Triana) Gleason

Figures 43E–F, Panama, *Almeda & Nakai 3487* (CAS)

Seed ovoid, 0.64–0.83 mm long, 0.38–0.49 mm wide; lateral symmetrical plane ovate, the highest point toward the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to obovate, ca. 70% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries raised, undulate, with Ω- and U-type patterns; periclinal walls slightly concave, microrelief verrucose (?).

Miconia meridensis Triana

Figures 43G–H, Venezuela, *Dorr et al. 5247* (CAS).

Seed narrowly ovoid, slightly angled, 0.57–0.7 mm long, 0.25–0.35 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed and oblong-net pattern is usually found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated to isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia molybdea Naudin

Figures 44A–B, Bolivia, *Nee 39032* (CAS).

Seed ovoid, 0.53–0.63 mm long, 0.35–0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone elliptic to obovate, ca. 75% the length of the seed. Appendage absent, but sometimes a small protuberance is present. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia multiplinervia Cogn.

Figures 44C–D, Panama, *Almeda et al. 6163* (CAS).

Seed ovoid, sometimes angled, 0.56–0.74 mm long, 0.28–0.39 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone ovate, ca. 80–90% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia multispicata Naudin

Figures 44E–F, Panama, *McPherson 12741* (CAS).

Seed pyramidal, 1.6–1.81 mm long, 0.95–1.12 mm wide; lateral and antiraphal symmetrical planes ovate to triangular, the highest point toward the chalazal side. Raphal zone ovate to suboblong, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia nervosa (Sm.) Triana

Figures 44G–H, French Guiana, *Prévost 1437* (CAS).

Seed narrowly ovoid to pyramidal, angled, 0.54–0.73 mm long, 0.18–0.27 mm wide; lateral and antiraphal symmetrical planes narrowly ovate to triangular, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture an oblong net pattern found on the lateral faces and occasionally near the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Miconia nitidissima Cogn.

Figures 45A–B, Venezuela, *Michelangeli et al. 821* (NY).

Seed ovoid, sometimes angled, 1–1.22 mm long, 0.65–0.76 mm wide; lateral and antiraphal symmetrical planes ovate,

the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Appendage present, ca. 24% the length of the seed, forming a right to obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia nystroemii Ekman ex Urb.

Figures 45C–D, Cuba, *Ekman 7157* (NY).

Seed ovoid, slightly angled, 0.6–0.83 mm long, 0.37–0.46 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 80–90% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a crateriform pattern found on the chalazal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with U-type pattern; periclinal walls convex, high-domed.

Miconia octopetala Cogn.

Figures 45E–F, Brazil, *Mori et al. 11063* (NY).

Seed ovate to widely ovoid, angled, 2.7–3.13 mm long, 2.48–2.55 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia oldemanii Wurdack

Figures 45G–H, French Guiana, *Skog & Feuillet 7085* (CAS).

Seed pyramidal, 0.72–0.92 mm long, 0.58–0.67 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone obovate to elliptic, ca. 75% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia pachyphylla Cogn.

Figures 46A–B, Puerto Rico, *Little 21621* (NY).

Seed ovoid, angled, 1.56–1.8 mm long, ca. 1 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage present, ca. 25% the length of the seed, forming an obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia papillosa (Desr.) Naudin

Figures 46C–D, Ecuador, *Moran & Paisano 114* (CAS).

Seed ovoid, 0.46–0.73 mm long, 0.3–0.41 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone elliptic, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia paradoxa (Mart. ex DC.) Triana

Figures 46E–F, Brazil, *Almeda et al. 9652* (CAS).

Seed ovoid, angled, 1.8–1.96 mm long, 1.32–1.49 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, nearly flat, microrelief punctate.

Miconia phanerostila Pilg.

Figures 46G–H, Brazil, *Prance et al. 8674* (NY).

Seed widely ovoid, sometimes angled, 2.72–2.94 mm long, ca. 1.9 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture an inconspicuous oblong-net pattern, mainly found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls slightly concave.

Miconia poeppigii Triana

Figures 47A–B, Colombia, *Zarucchi et al. 4882* (CAS).

Seed pyramidal, 1.1–1.27 mm long, 0.47–0.62 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone triangular, nearly as long as the seed. Appendage present, ca. 30% the length of the seed, forming a right to obtuse angle. Multicellular sculpture a rugulose pattern found on the lateral and chalazal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with Ω-, S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia polyandra Gardner

Figures 47C–D, Brazil, *Vervloet 2379* (UPCB).

Seed widely ovoid, sometimes angled, 1.14–1.32 mm long, 0.81–0.93 mm wide; lateral symmetrical plane ovate to widely ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate, ca. 80% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia polygama Cogn.

Figures 47E–F, Bolivia, *Solomon 5253* (CAS).

Seed ovoid, 0.54–0.72 mm long, 0.38–0.43 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture an oblong-net pattern occasionally found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, almost flat.

Miconia prasina (Sw.) DC.

Figures 47G–H, Belize, *Davidse et al. 35603* (CAS).

Seed pyramidal, ca. 1 mm long, 0.32–0.49 mm wide; lateral symmetrical plane narrowly triangular, the highest point

toward the chalazal side; antiraphal symmetrical plane ovate to triangular. Raphal zone triangular, ca. 80% the length of the seed. Appendage present, ca. 30% the length of the seed, forming a right to obtuse angle. Multicellular sculpture an oblong-net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia procumbens (Gleason) Wurdack

Figures 48A–B, Panama, *Hammel et al. 16388* (CAS).

Seed ovoid, 0.24–0.33 mm long, 0.14–0.2 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 65% the length of the seed. Appendage present, 100–110 % the length of the seed, forming an obtuse angle. Multicellular sculpture an oblong-net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries undulate, with U-type pattern; periclinal walls slightly concave, microrelief punctate; the cells of the appendage with channeled anticlinal boundaries, undulate with S- and U-type patterns, periclinal walls convex, low-domed, microrelief absent.

Miconia pubipetala Miq.

Figures 48C–D, Venezuela, *Steyermark 87152* (NY).

Seed pyramidal, 1–1.4 mm long, 0.76–0.95 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane triangular to suboblong. Raphal zone triangular, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Miconia pulvinata Gleason

Figures 48E–F, Venezuela, *Davidse & González 22439* (CAS).

Seed ovoid, sometimes angled, 0.46–0.59 mm long, 0.27–0.34 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone obovate to elliptic, 80–90% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Miconia punctata (Desr.) D.Don ex DC.

Figures 48G–H, Brazil, *Boom et al. 8770* (CAS).

Seed widely ovoid, sometimes angled, ca. 2.5–3 mm long, 1.53–1.75 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave, microrelief punctate.

Miconia pusilliflora (DC.) Naudin

Figures 49A–B, Paraguay, *Basualdo 002677* (CAS).

Seed widely ovoid, 1.86–2.28 mm long, 1.5–1.6 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia pyramidalis (Desr.) DC.

Figures 49C–D, Dominican Republic, *Judd et al. 8115* (NY).

Seed ovoid, 0.75–0.9 mm long, 0.37–0.5 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed.

Miconia ramboi Brade

Figures 49E–F, Brazil, *Hatschbach & Ribas 61315* (CAS).

Seed ovoid, sometimes angled, 1.28–1.38 mm long, 0.83–0.96 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls concave, microrelief punctate.

Miconia reducens Triana

Figures 49G–H, Panama, *McPherson 7420* (CAS).

Seed ovoid, 0.6–0.8 mm long, 0.32–0.44 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Miconia rimalis Naudin

Figures 50A–B, Brazil, *Amorim et al. 2151* (NY).

Seed widely ovoid, 1.74–1.79 mm long, 1–1.25 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture an oblong-net pattern found toward the micropylar side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries raised, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia rosea Gleason

Figures 50C–D, Bolivia, *Solomon 13939* (CAS).

Seed ovoid, angled, 0.5–0.61 mm long, 0.2–0.24 mm wide; lateral and dorsal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone obovate, ca. 65% the length of the seed, ventrally expanded toward the micropylar side. Multicellular sculpture an oblong net pattern found on the antiraphal side, a reticulate pattern on the chalazal face. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia rubiginosa (Bonpl.) DC.

Figures 50E–F, Panama, *Duke & Mussell 6598* (CAS).

Seed ovoid, angled, 1.26–1.48 mm long, 0.95–1 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia rufescens (Aubl.) DC.

Figures 50G–H, Guyana, *Cremers 5222* (CAS).

Seed ovoid, angled, 0.87–1 mm long, 0.56–0.66 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to suboblong, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia rugosa Triana

Figures 51A–B, Brazil, *Prance et al. 2245* (NY). Photo: Harinder Mater.

Seed pyramidal, ca. 1 mm long, ca. 0.64 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 75% the length of the seed. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with U-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief punctate.

Miconia samanensis Urb.

Figures 51C–D, Dominican Republic, *Watson et al. 1263* (NY).

Seed ovoid, sometimes angled, 0.68–0.93 mm long, 0.43–0.51 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 75% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a crateriform pattern found toward the antiraphal and chalazal sides. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, irregularly curved; periclinal walls convex, high-domed.

Miconia sanctiphilippi Naudin

Figures 51E–F, Venezuela, *Castillo & Bocaranda 3042* (CAS).

Seed pyramidal, 0.82–1mm long, 0.49–0.63 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side; antiraphal symmetrical plane triangular to suboblong. Raphal zone elliptic to suboblong, ca. 90% the length of the seed, ventrally expanded. Multicellular sculpture a rugose pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia schlimii Triana

Figures 51G–H, Guatemala, *Lundell & Contreras 19881* (CAS).

Seed ovoid, angled, 0.47–0.62 mm long, 0.2–0.33 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone suboblong, nearly as long as the seed. Multicellular sculpture a rugose pattern found on the chalazal side, an oblong-net pattern on the antihilum and lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia schnellii Wurdack

Figures 52A–B, Costa Rica, *Almeda et al. 6786* (CAS).

Seed ovoid, 0.76–1 mm long, 0.45–0.55 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point

toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, U-type patterns; periclinal walls convex, low-domed.

Miconia sclerophylla Triana

Figures 52C–D, Brazil, *Irwin et al. 28182* (NY). Photo: Katie Huish.

Seed widely ovoid, 1.52–1.68 mm long, 1.39–1.48 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate to nearly circular. Raphal zone circular, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia selleana Urb. & Ekman

Figures 52E–F, Dominican Republic, *Judd et al. 5106* (NY).

Seed ovoid, angled, 0.79–0.91 mm long, 0.52–0.68 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone suboblong, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with U-type pattern; periclinal walls convex, high-domed.

Miconia sellowiana Naudin

Figures 52G–H, Brazil, *Azebedo et al. 357* (CAS).

Seed widely ovoid, 1.66–1.75 mm long, 1–1.24 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate, ca. 90% the length of the seed. Multicellular sculpture a rugulose pattern found on the micropylar side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries raised, undulate, with U-type pattern; periclinal walls slightly concave.

Miconia septentrionalis Judd & R.S.Beaman

Figures 53A–B, Dominican Republic, *Jiménez & Polanco 1853* (FLAS).

Seed ovoid, angled, 0.48–0.64 mm long, 0.24–0.28 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to suboblong, ca. 80% the length of the seed. Multicellular sculpture an inconspicuous reticulate pattern found on the chalazal side, an oblong-net pattern on the micropylar side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed.

Miconia serrulata (DC.) Naudin

Figures 53C–D, Bolivia, *Fernández & Susana 249* (CAS).

Seed ovoid, 0.6–0.72 mm long, 0.38–0.46 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate, ca. 70% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia sessilifolia Naudin

Figures 53E–F, Bolivia, *Kessler et al. 4255* (CAS).

Seed ovoid, 0.48–0.58 mm long, 0.27–0.31 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side and near the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 90% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with inconspicuous U-type pattern; periclinal walls par-convex, par-domed, microrelief striate.

Miconia sintenisii Cogn.

Figures 53G–H, Puerto Rico, *Almeda et al. 7485* (CAS).

Seed ovoid, angled, 0.51–0.59 mm long, 0.19–0.31 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Appendage absent, but sometimes a small protuberance is present. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed.

Miconia skeaniana Judd

Figures 54A–B, Cuba, *Acuña 6760* (NY).

Seed ovoid, angled, 0.75–0.9 mm long, 0.4–0.52 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to suboblong. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but a protuberance may be present. Multicellular sculpture an oblong-net pattern found on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia smaragdina Naudin

Figures 54C–D, Belize, *Davidse & Holland 36725* (CAS).

Seed pyramidal, 0.6–0.82 mm long, 0.34–0.44 mm wide; lateral and antiraphal symmetrical planes triangular to ovate, the highest point toward the chalazal side. Raphal zone triangular, ca. 80% the length of the seed. Appendage absent, but sometimes a small protuberance is present. Multicellular sculpture a rugose pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with inconspicuous U-type pattern; periclinal walls convex, low-domed, microrelief verrucose.

Miconia sphagnicola Urb. & Ekman

Figures 54E–F, Dominican Republic, *Liogier 13154* (NY).

Seed ovoid, angled, 0.79–0.97 mm long, 0.45–0.68 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a crateriform pattern usually found on the chalazal side, sometimes present on the lateral and antiraphal faces. Cells arranged in an aligned pattern. Individual cells isodiametric, occasionally elongated, anticlinal boundaries channeled, irregularly curved; periclinal walls convex, high-domed.

Miconia splendens (Sw.) Griseb.

Figures 54G–H, Colombia, *Clark & Clark 7158* (CAS).

Seed ovoid, sometimes strongly angled, 1–1.2 mm long, 0.6–0.87 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate, widely ovate, or triangular. Raphal zone ovate to triangular, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave.

Miconia stenobotrys (Rich.) Naudin

Figures 55A–B, Dominican Republic, *Mejía et al. 1465* (NY).

Seed ovoid, angled, 0.96–1.19 mm long, 0.69–0.74 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side and near the central part of the seed; antiraphal symmetrical plane ovate to suboblong. Raphal zone suboblong, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, sometimes isodiametric, anticlinal boundaries channeled, irregularly curved to undulate with U-type pattern; periclinal walls convex, low-domed, sometimes with small bumps; the cells near the hilar zone with evident undulate U-type pattern anticlinal boundaries.

Miconia stenostachya DC.

Figures 55C–D, Brazil, *King & Almeda 8308* (CAS).

Seed ovoid to pyramidal, angled, 0.86–1.2 mm long, 0.67–0.88 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side or the central part of the seed; antiraphal symmetrical plane ovate to widely ovate. Raphal zone ovate to suboblong, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia subcompressa Urb.

Figures 55E–F, Dominican Republic, *Judd et al. 6561* (NY).

Seed ovoid, slightly angled, 0.56–0.68 mm long, 0.29–0.41 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed.

Miconia superba Ule

Figures 55G–H, Guyana, *Hoffman & Henkel 3144* (NY).

Seed ovoid, angled, 1.25–1.67 mm long, 0.57–0.61 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming a right to acute angle. Multicellular sculpture a reticulate pattern found on the chalazal side, occasionally present on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, sporadically dividing into two or more segments, microrelief usually absent, sometimes a striate pattern more evident toward the undulations.

Miconia sylvatica (Schltdl.) Naudin

Figures 56A–B, Mexico, *Rosas 303* (CAS).
Seed ovoid, 0.65–0.8 mm long, 0.36–0.42 mm wide; lateral and antiraphal symmetrical plane ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia tetrandra (Sw.) D.Don

Figures 56C–D, Dominican Republic, *Zanoni et al. 22506* (NY).

Seed narrowly ovoid, angled, 1.44–1.7 mm long, 0.59–0.76 mm wide; lateral symmetrical plane narrowly ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Multicellular sculpture a rugulose pattern found throughout the seed, occasionally an oblong-net pattern on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-dome, nearly flat, microrelief inconspicuously punctate.

Miconia tetrastoma Naudin

Figures 56E–F, Dominican Republic, *Judd et al. 6578* (NY).

Seed ovoid, 0.46–0.56 mm long, 0.34–0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone ovate, 80–90% the length of the seed. Multicellular sculpture a crateriform pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed; ocassionally the cells on the lateral faces with convex, low-domed periclinal walls.

Miconia theizans (Bonpl.) Cogn.

Figures 56G–H, Colombia, *Luteyn et al. 7374* (CAS).

Seed ovoid, 0.56–0.73 mm long, 0.34–0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or the central part of the seed. Raphal zone ovate to obovate, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-, S-, and U-type patterns; periclinal walls convex, low- to high-domed, occasionally dividing into two or more segments.

Miconia thomasiana DC.

Figures 57A–B, Puerto Rico, *Axelrod & Fritsch 12565* (CAS).

Seed ovoid, slightlty angled, 1.42–1.94 mm long, 1–1.38 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to triangular, nearly as long as the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed, nearly flat, microrelief inconspicuously punctate.

Miconia tomentosa (Rich.) D.Don ex DC.

Figures 57C–D, Brazil, *Carvalho & Mattos 366* (CAS).

Seed pyramidal, 1–1.27 mm long, 0.54–0.68 mm wide; lateral symmetrical plane triangular, the highest point toward the chalazal side ot the central part of the seed; antiraphal symmetrical plane suboblong. Raphal zone suboblong, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture a rugose pattern found throughout the seed, sometimes an oblong-net pattern on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with Ω-, S-, and U-type patterns; periclinal walls convex, low-domed to nearly flat, frequently dividing into two or more segments.

Miconia tonduzii Cogn.

Figures 57E–F, Costa Rica, *Umaña & Chacón 540* (CAS).

Seed ovoid, 0.41–0.59 mm long, 0.29–0.33 mm wide; lateral and lateral symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 60% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed, microrelief minutely verrucose.

Miconia trianae Cogn.

Figures 57G–H, Brazil, *Strier 1070* (NY).

Seed ovoid, 1.36–1.49 mm long, 0.64–0.84 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave, occasionally convex, low-domed, nearly flat.

Miconia triangularis Gleason

Figures 58A–B, Ecuador, *Asplund 18909* (NY).

Seed ovoid, 0.52–0.68 mm long, 0.28–0.36 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, 80–90% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with U-type pattern; periclinal walls convex, low-domed to nearly flat.

Miconia trimera Wurdack

Figures 58C–D, French Guiana, *Krijger & Opdam 10* (CAS).
Seed ovoid, 0.3–0.4 mm long, 0.19–0.27 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point near the central part of the seed. Raphal zone ovate to elliptic, ca. 90% the length of the seed. Appendage present, ca. 30% the length of the seed, almost forming a 180º angle in reference to the raphal zone. Multicellular sculpture a tuberculate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω-type pattern; periclinal walls convex, low-domed to nearly flat, microrelief striate; the cells on the appendage larger than the rest of the cells, with irregularly curved anticlinal boundaries and microrelief absent.

Miconia triplinervis Ruiz & Pav.

Figures 58E–F, Guatemala, *Contreras 7899* (CAS).

Seed narrowly ovoid, 0.43–0.57 mm long, 0.18–0.23 mm wide; lateral and antiraphal symmetrical planes narrowly ovate, the highest point toward the chalazal side. Raphal zone obovate to elliptic, ca. 60% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief striate.

Miconia tuberculata (Naudin) Triana

Figures 58G–H, Venezuela, *King et al. 10553* (CAS).

Seed ovoid, 0.38–0.49 mm long, 0.19–0.22 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 70% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia undata Triana

Figures 59A–B, Bolivia, *Araujo et al. 640* (NY).

Seed ovoid, angled, 0.76–0.92 mm long, 0.34–0.44 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 85% the length of the seed. Appendage absent, but a small

protuberance may be present. Multicellular sculpture an oblong-net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Miconia valtheri Naudin

Figures 59C–D, Brazil, *Camargo 91* (UPCB).

Seed widely ovoid, angled, 1.1–1.15 mm long, 0.82–1 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane widely ovate to elliptic. Raphal zone ovate to elliptic, ca. 75% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S-type pattern; periclinal walls convex, low-domed, nearly flat.

Miconia viscidula Urb. & Cogn.

Figures 59E–F, Dominican Republic, *Veloz & Feliz 790* (FLAS).

Seed narrowly ovoid to narrowly pyramidal, angled, 1–1.3 mm long, 0.24–0.27 mm wide; lateral and antiraphal symmetrical planes narrowly ovoid to narrowly triangular, the highest point toward the chalazal side. Raphal zone linear, 80–90% the length of the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Multicellular sculpture an oblong-net pattern pattern found on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved to undulate with S-type pattern; periclinal walls convex, low-domed.

Miconia willdenowii Klotzsch ex Naudin

Figures 59G–H, Brazil, *Caddah 757* (UPCB).

Seed widely ovoid, 3.44–3.93 mm long, 2.53–2.68 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane widely ovate. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a rugose pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, irregularly curved; periclinal walls concave, microrelief punctate.

Necramium gigantophyllum Britton

Figures 60A–B, Trinidad and Tobago, *W.G.F. et al. 11953* (NY).

Seed narrowly ovoid, occasionally slightly angled, 0.5–0.62 mm long, 0.24–0.29 mm wide; lateral and antiraphal symmetrical planes narrowly ovate, the highest point toward the chalazal side. Raphal zone ovate, as long as the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed, sometimes dividing into two or more segments.

Ossaea brenesii Standl.

Figures 60C–D, Panama, *Hamilton & Davidse 2661* (CAS).

Seed ovoid, angled, 0.3–0.38 mm long, 0.15–0.21 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 90% the length of the seed, ventrally expanded toward the micropyle. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief inconspicuously striate.

Ossaea capillaris (D.Don) Cogn.

Figures 60E–F, Ecuador, *Holm-Nielsen et al. 20514* (CAS).

Seed ovoid, 0.29–0.35 mm long, 0.18–0.22 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone obovate to elliptic, ca. 75% the length of the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Ossaea macrophylla (Benth.) Cogn.

Figures 60G–H, Nicaragua, *Rueda et al. 8682* (CAS).

Seed pyramidal, 0.31–0.43 mm long, 0.12–0.16 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side. Raphal zone suboblong, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Ossaea micrantha (Sw.) Macfad. ex Cogn.

Figures 61A–B, Ecuador, *Luteyn & Berg 14374* (CAS).

Seed ovoid, usually angled, 0.3–0.43 mm long, 0.13–0.17 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, nearly as long as the seed, usually ventrally expanded toward the micropyle. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong-net pattern usually found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Ossaea quadrisulca (Naudin) Wurdack

Figures 61C–D, Ecuador, *Hurtado et al. 2069* (CAS).

Seed ovoid, 0.31–0.4 mm long, 0.23–0.28 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane ovoid to elliptic. Raphal zone circular, 60–70% the length of the seed. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type pattern; periclinal walls par-convex, par-domed, microrelief verrucose.

Ossaea robusta (Triana) Cogn.

Figures 61E–F, Panama, *Sytsma & Stevens 2210* (CAS).

Seed ovoid, angled, 0.26–0.34 mm long, ca. 0.11 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane suboblong. Raphal zone suboblong to ovate, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong-net pattern pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose.

Ossaea spicata Gleason

Figures 61G–H, Panama, *McPherson 20759* (CAS).

Seed narrowly pyramidal, 0.31–0.43 mm long, 0.1–0.16 mm wide; lateral symmetrical plane narrowly triangular, the

highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone suboblong, ca. 90% the length of the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief verrucose or absent.

Pachyanthus lundellianus (L.O.Williams) Judd & Skean

Figures 62A–B, Honduras, *Espinal 164* (CAS).

Seed ovoid, angled, 0.71–0.85 mm long, 0.41–0.56 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief inconspicuously punctate.

Sagraea fuertesii (Cogn.) Alain

Figures 62C–D, Dominican Republic, *Pimentel & García 818* (NY). Photo: Katie Huish.

Seed ovoid, 0.7–0.75 mm long, ca. 0.4 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with inconspicuous Ω-type pattern; periclinal walls convex, high-domed.

Sagraea scalpta (Vent.) Naudin

Figures 62E–F, Haiti, *W.S. Judd & J.D. Skean Jr. 6821* (NY).

Seed ovoid, angled, 0.65–0.79 mm long, 0.28–0.36 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone elliptic to suboblong, ca. 80% the length of the seed. Appendage present, ca. 20% the length of the seed, forming a right to obtuse angle. Multicellular sculpture an oblong-net pattern found on the antiraphal side. Cells arranged in an aligned pattern. Individual cells isodiametric, occasionally elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls par-convex, par-domed; the cells on the appendage and near the hilar zone with convex, high-domed periclinal walls.

Tetrazygia elaeagnoides (Sw.) DC

Figures 62G–H, "West Indies", *Emers 291* (CAS).

Seed pyramidal, 0.87–1.17 mm long, 0.28–0.4 mm wide; lateral and dorsal symmetrical planes triangular, the highest point toward the chalazal side. Raphal zone triangular, ca. 80% the length of the seed. Appendage absent, but a protuberance may be present. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, some cells with punctate microrelief.

Tetrazygia urbaniana (Cogn.) Croizat ex Mosc.

Figures 63A–B, Dominican Republic, *Zanoni & García 41559* (NY).

Seed ovoid, 0.51–0.61 mm long, 0.21–0.32 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate to suboblong, ca. 85% the length of the seed. Multicellular sculpture an oblong net pattern found on the antiraphal side. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief striate.

Tococa caquetana Sprague

Figures 63C–D, Ecuador, *Cerón & Neill 2340* (CAS).

Seed pyramidal, 0.42–0.5 mm long, 0.16–0.23 mm wide; lateral and antiraphal symmetrical planes triangular, the highest point toward the chalazal side; antiraphal symmetrical plane triangular to ovate. Raphal zone suboblong, ca. 80–90% the length of the seed. Appendage present, ca. 20% the length of the seed, forming an obtuse angle. Multicellular sculpture an oblong net pattern found on the lateral and antiraphal sides. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, microrelief inconspicuously verrucose; the cells on the appenfage sometimes with irregularly curved anticlinal boundaries.

Tococa macrophysca Spruce ex Triana

Figures 63E–F, Venezuela, *Stein & Gentry 1700* (CAS).

Seed narrowly ovoid, 1.26–1.6 mm long, 0.56–0.66 mm wide; lateral symmetrical plane narrowly ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone ovate to elliptic, ca. 90% the length of the seed, ventrally expanded. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an aligned pattern. Individual cells elongated, occasionally isodiametric, anticlinal boundaries channeled, irregularly curved; periclinal walls convex, high-domed.

Tococa nitens (Benth.) Triana

Figures 63G–H, Venezuela, *Kral 72037* (CAS).

Seed ovoid, usually angled, 1.16–1.26 mm long, 0.67–0.7 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side or near the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 90% the length of the seed. Multicellular sculpture an oblong net pattern found on the lateral faces. Cells arranged in an irregular pattern. Individual cells isodiametric, occassionally elongated, anticlinal boundaries channeled, irregularly curved to undulate with S- and U-type patterns; periclinal walls convex, low-domed to nearly flat.

Tococa perclara Wurdack

Figures 64A–B, Venezuela, *González & Ortega 1239* (CAS).

Seed ovoid, 0.6–0.74 mm long, 0.34–0.44 mm wide; lateral symmetrical plane ovate, the highest point near the central part of the seed; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, ca. 80% the length of the seed. Multicellular sculpture a reticulate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Tococa platyphylla Benth.

Figures 64C–D, Panama, *Antonio 5042* (CAS).

Seed ovoid, 0.61–0.8 mm long, 0.35–0.41 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side or near the central part of the seed. Raphal zone ovate, nearly as long as the seed. Multicellular sculpture an alveolate pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed to nearly flat, microrelief verrucose.

Tococa quadrialata (Naudin) J.F.Macbr.

Figures 64E–F, Peru, *Díaz et al. 698* (CAS).

Seed ovoid, angled, 0.86–0.97 mm long, 0.47–0.54 mm wide; lateral and antiraphal symmetrical planes ovate, the highest point toward the chalazal side. Raphal zone ovate, ca. 80% the length of the seed. Multicellular sculpture a crateriform pattern found on the chalazal side, an oblong-net pattern on the lateral and antiraphal sides. Cells arranged in an aligned pattern. Individual cells isodiametric, anticlinal boundaries channeled, irregularly curved to undulate with Ω- and U-type patterns; periclinal walls par-convex, par-conical.

Tococa rotundifolia (Triana) Wurdack

Figures 64G–H, Venezuela, *Clark 6986* (CAS).

Seed ovoid, 1.84–2.14 mm long, 1.31–1.34 mm wide; lateral symmetrical plane ovate, the highest point toward the chalazal side; antiraphal symmetrical plane ovate to elliptic. Raphal zone ovate to elliptic, nearly as long as the seed. Multicellular sculpture an inconspicuous oblong net pattern found throughout the seed. Cells arranged in an irregular pattern. Individual cells isodiametric, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls slightly concave, microrelief punctate.

Tococa spadiciflora Triana

Figures 65A–B, Colombia, *Callejas et al. 2708* (CAS).

Seed ovoid, angled, 0.29–0.36 mm long, 0.17–0.2 mm wide; lateral symmetrical plane ovate to triangular, the highest point toward the chalazal side; antiraphal symmetrical plane ovate. Raphal zone obovate, ca. 80% the length of the seed. Appendage absent, but a small protuberance may be present.Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, undulate, with Ω- and U-type patterns; periclinal walls convex, low-domed, occasionally high-domed, microrelief striate.

Tococa subciliata (DC.) Triana

Figures 65C–D, Guyana, *Clarke 1393* (CAS).

Seed narrowly ovoid, angled, sometimes longitudinally curved, 2.45–2.66 mm long, 0.84–1 mm wide; lateral and antiraphal symmetrical planes narrowly ovate, the highest point toward the chalazal side. Raphal zone narrowly ovate to suboblong, nearly as long as the seed. Cells arranged in an aligned pattern. Individual cells elongated, anticlinal boundaries channeled, irregularly curved; periclinal walls par-convex, par-conical, microrelief striate.

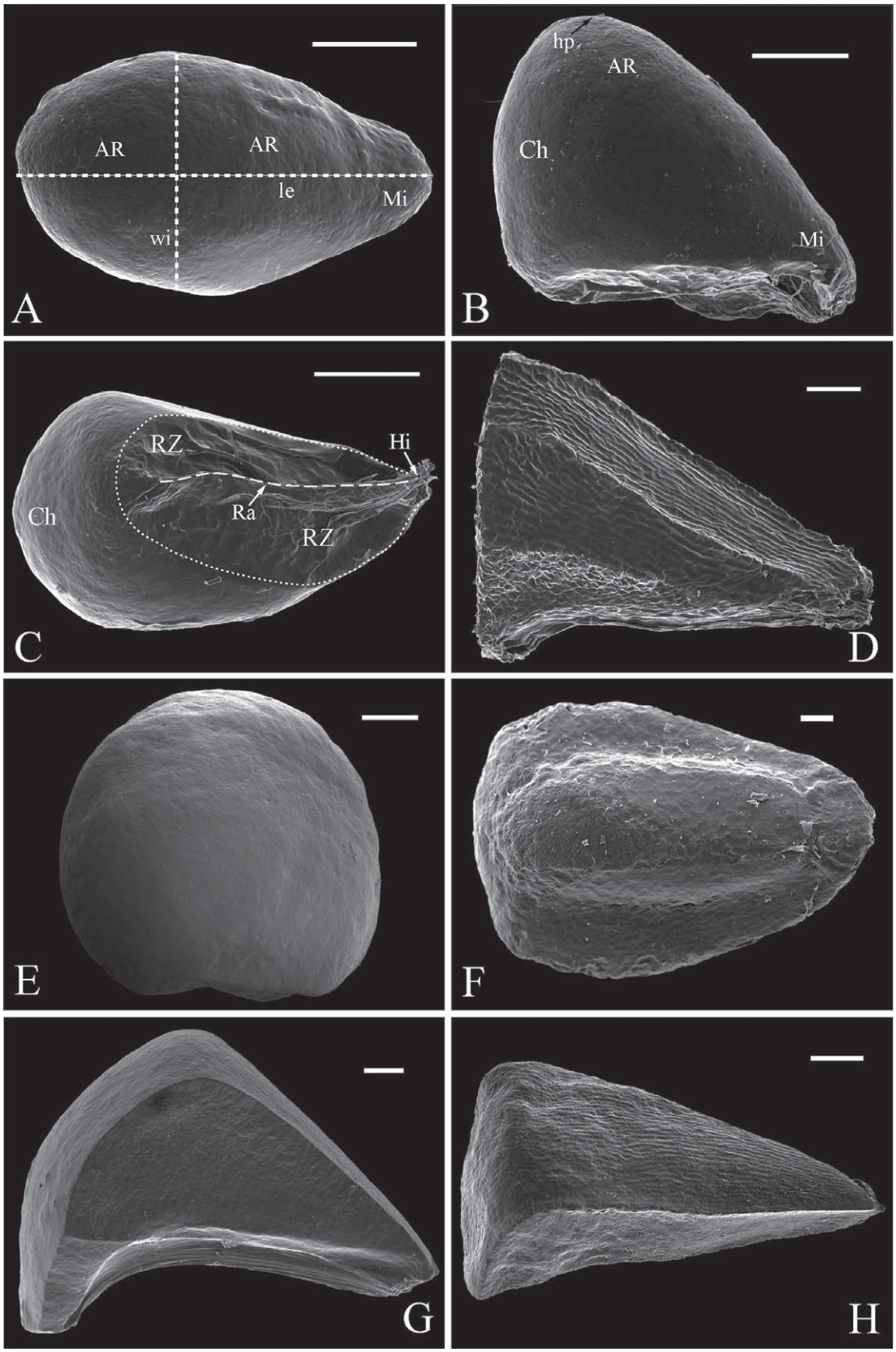

FIGURE 1. General features of Miconieae seeds. A–C, ovoid seeds of *Leandra melanodesma* showing different parts considered for this study: A, antiraphal view; B, lateral view; C, raphal view. D–E, three-dimensional shapes: D, pyramidal (*Miconia ibaguensis*); E, subspheroid (*M. chartacea*). F, antiraphal view of *Conostegia speciosa*, showing the horizontally expanded base. G, angled ovoid seed of *M. dispar*. H, triangular antiraphal symmetrical plane of *M. melinonis*. Abbreviations: AR, antiraphal side; Ch, chalazal side; Hi, hilum; hp, highest point of the seed in lateral view; le, length; Mi, micropylar side; Ra, raphe; RZ, raphal zone (area included within the dotted line); wi, width. Scale bars: A–D, F–G = 0.1 mm; E = 0.6 mm; H = 0.3 mm.

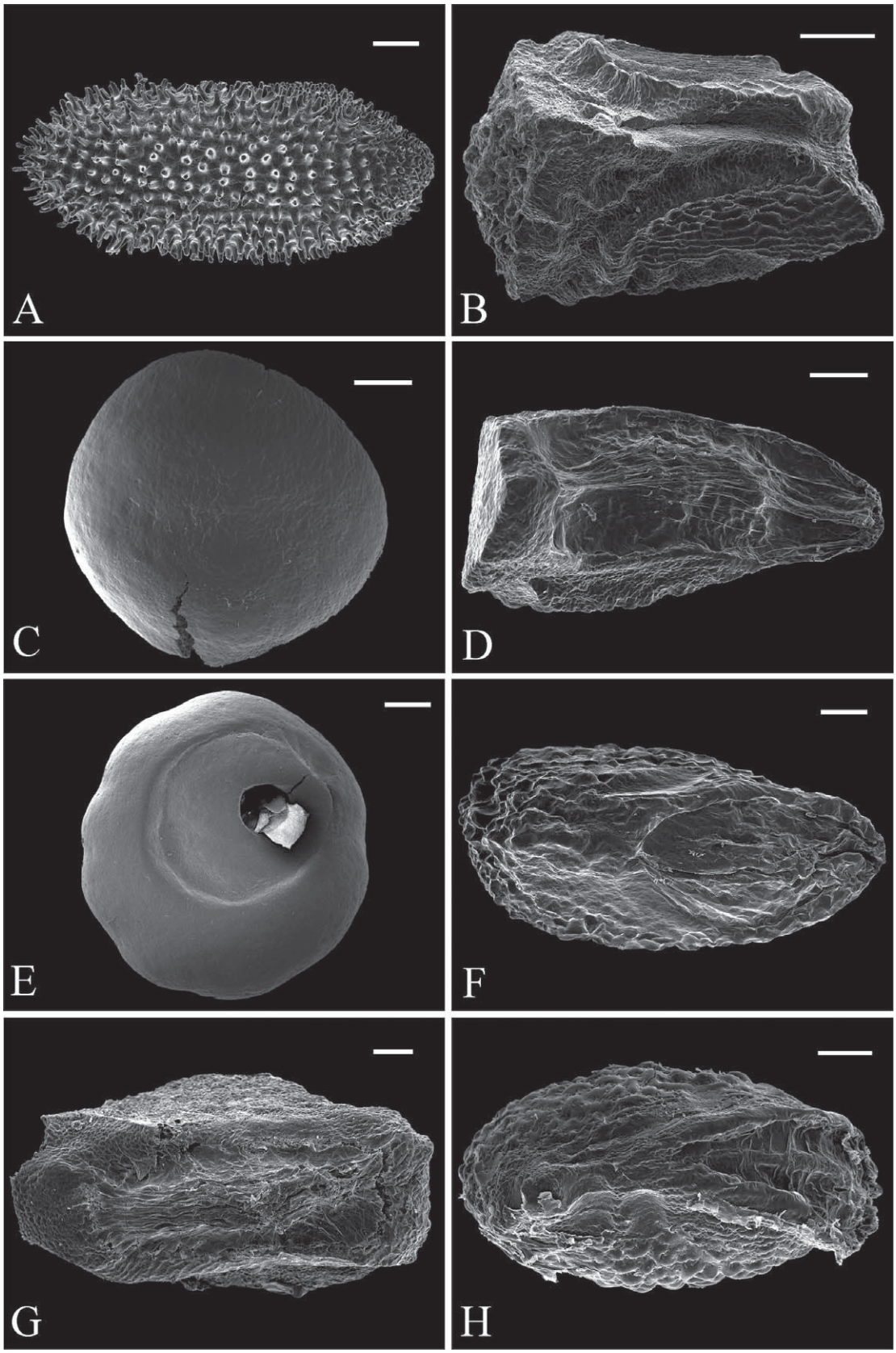

FIGURE 2. A–C, antiraphal symmetrical planes: A, elliptic (*Miconia campestris*); B, suboblong (*M. tomentosa*); C, circular (*M. longicuspis*). D–H, raphal zone symmetrical planes: D, triangular (*Clidemia caudata*); E, circular (*M. chartacea*); F, elliptic (*M. laevigata*); G, suboblong (*M. rugosa*); H, obovate (*Tococa spadiciflora*). Scale bars: A = 0.09 mm; B = 0.2 mm; C, E = 0.5 mm; D = 0.08 mm; F, G = 0.1 mm; H = 0.05 mm.

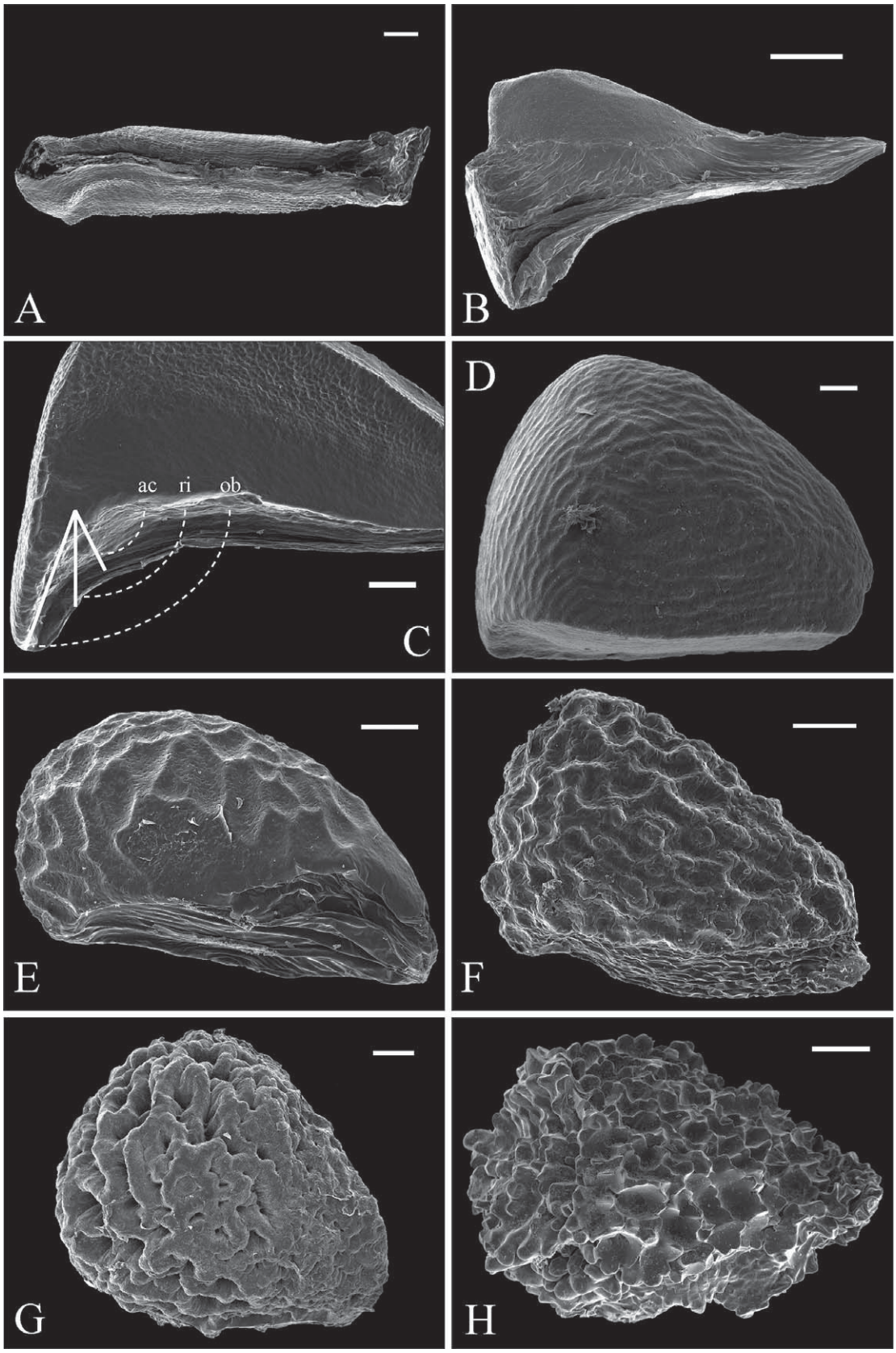

FIGURE 3. A, linear antiraphal symmetrical plane of *Miconia viscidula*. B, ventral expansion of the raphal area of *Clidemia reitziana*. C, seed of *M. poeppigii* showing the angles formed by the appendages with respect to the raphal area. D–H, multicellular sculpture: D, rugulose (*M. cuspidata*); E, reticulate (*M. pulvinata*); F, rugose (*M. reducens*); G, ruminate (*M. amplinodis*); H, crateriform (*M. brachybotrya*). Abbreviations: ac, acute angle; ob, obtuse angle; ri, right angle. Scale bars: A–D, F–G = 0.1 mm; E, H = 0.08 mm.

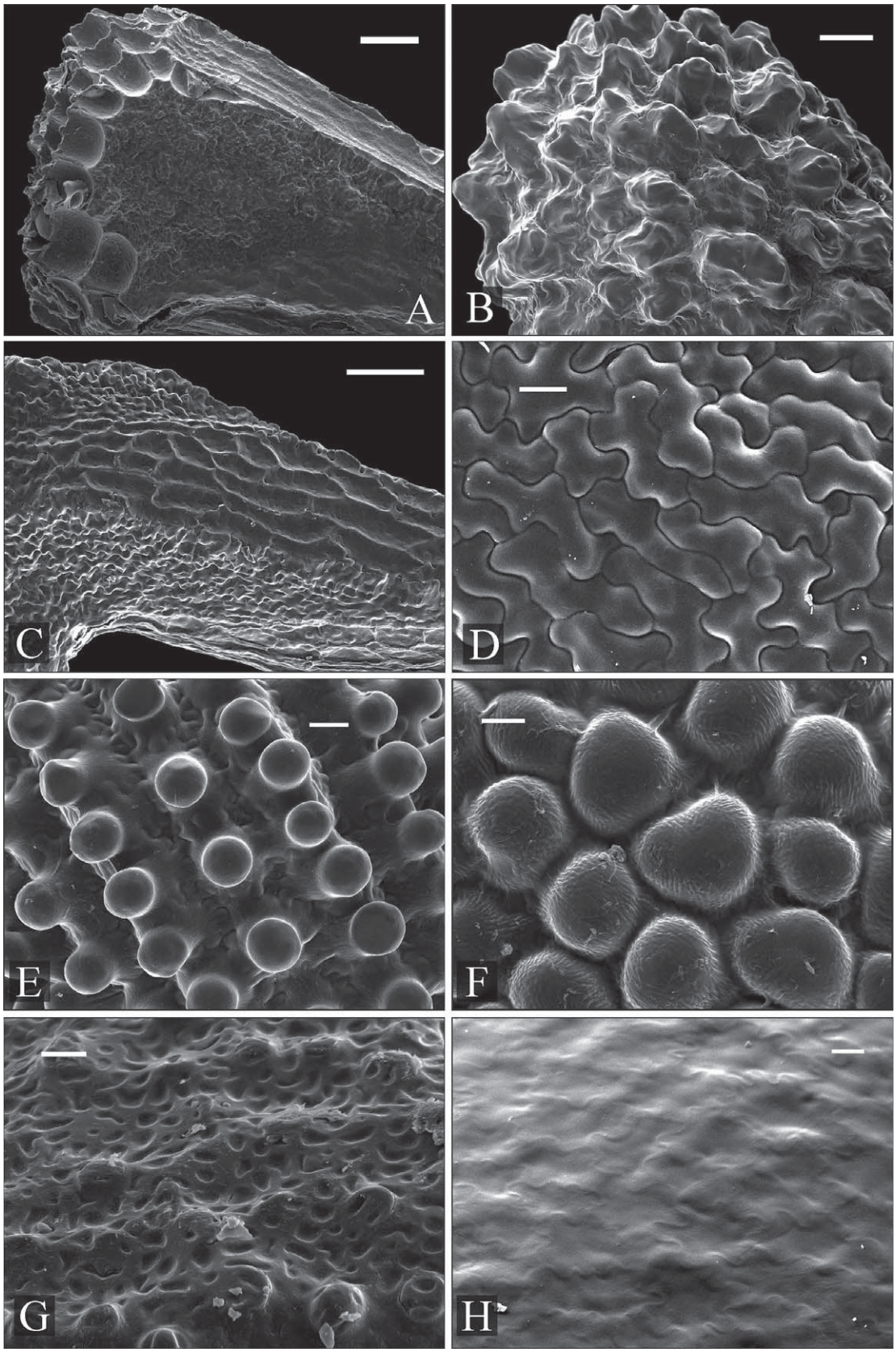

FIGURE 4. A–C, multicellular sculpture: A, alveolate (chalazal side of *Miconia dodecandra*); B, tuberculate (*M. serrulata*); C, oblong-net (*Clidemia charadrophylla*). D–E, general arrangement of the cells with respect to each other: D, irregular pattern (*M. biperulifera*); E, aligned pattern (*Leandra agrestis*). F, isodiametric cells of *Mecranium acuminatum.* G–H, relief of the anticlinal cell walls: G, inconspicuous (*Miconia marginata*); H, raised (*Miconia rimalis*). Scale bars: A = 0.1 mm; B = 0.05 mm; C = 0.06 mm; D–E = 0.02 mm; F = 0.09 mm; G–H = 0.01 mm.

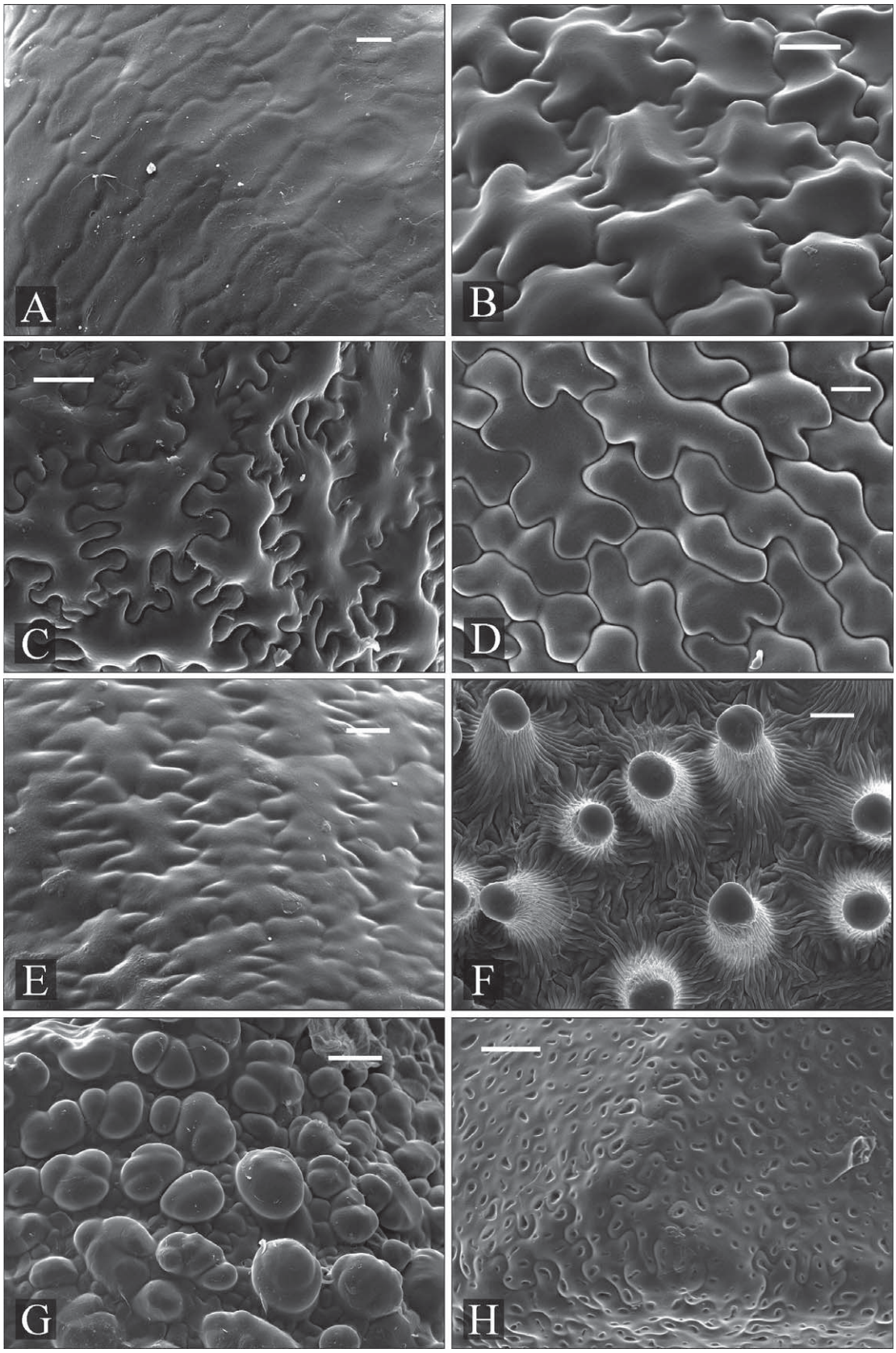

FIGURE 5. A, irregularly curved anticlinal walls of cells of *Miconia leiotricha*. B–E, undulation types of the anticlinal cell walls: B, U-type (*M. cubensis*); C, Ω-type (*Ossaea brenesii*); D, S-type (*M. subcompressa*); E, V-type (*Conostegia macrantha*). F, par-conical periclinal wall type of the cells of *M. campestris*. G, periclinal walls of the cells of *Clidemia monantha* dividing into two or more segments. H, punctate microrelief of the periclinal walls of the cells of *C. reitziana*. Scale bars: A–H = 0.01 mm.

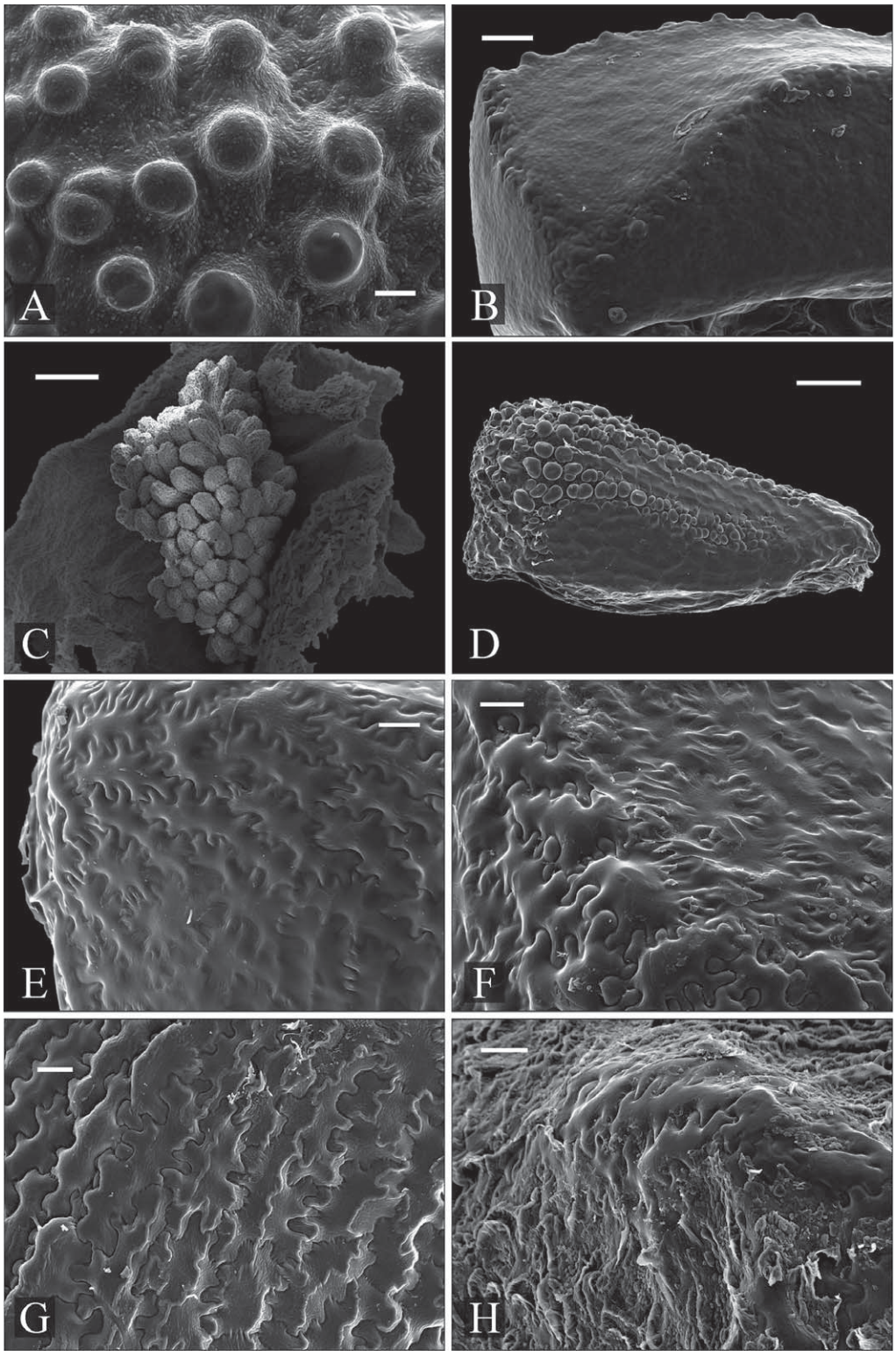

FIGURE 6. A, verrucose microrelief of the periclinal walls of *Leandra dichotoma*. B, presence of cells with features different from the cells of the rest of the corpus of the seed (angulations) of *Miconia ligulata*. C, ovule packing within a locule of a flower of *L. granatensis*, which may cause compression and induce changes in seed morphological features (*Almeda et al. 10216*, CAS). D–G, effects of compression by neighboring seeds on morphological features: D, *Necramium gigantophyllum*, showing compression on a lateral face; E, channeled anticlinal walls are progressively less evident toward the raphal area in *Ossaea micrantha*; F, in some cells on the lateral faces of seeds of *O. brenesii*, the convex relief of the periclinal walls does not fully develop, thus resembling concave cells; G, unusual cuticular striations are present on the periclinal walls of the seeds of *O. spicata*, likely formed during development of neighboring seeds. H, endocarp remnants covering the seed of *Clidemia clandestina*, which in some cases may be confused with microrelief of the periclinal walls. Scale bars: A, C, E–G = 0.01 mm; B = 0.03 mm; D = 0.08 mm; H = 0.02 mm.

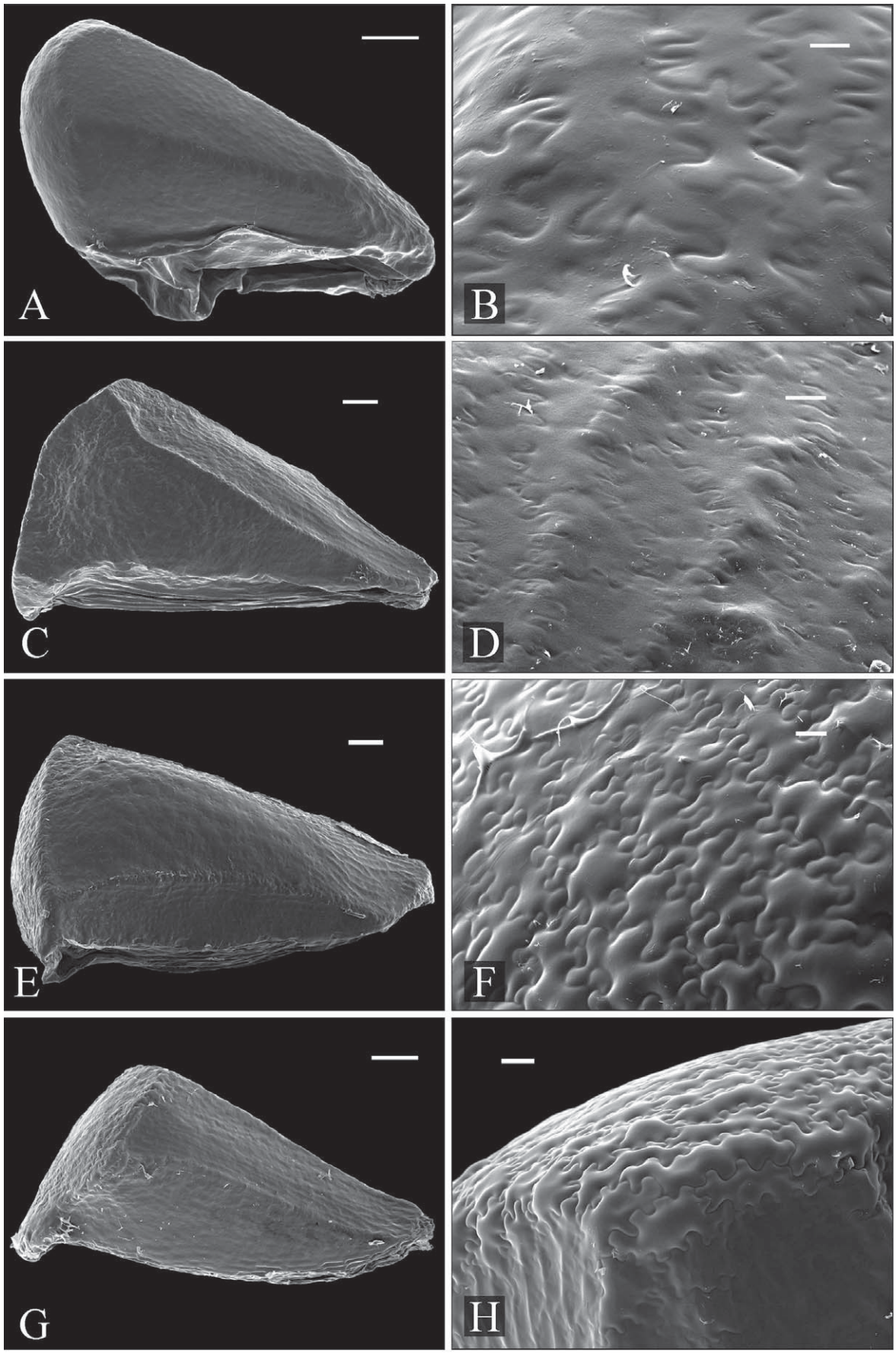

FIGURE 7. A–B, *Anaectocalyx bracteosa*; C–D, *Calycogonium glabratum*; E–F, *Charianthus alpinus*; G–H, *Ch. dominicensis*. Scale bars: A = 0.09 mm; B, E = 0.006 mm; C = 0.06 mm; D, F = 0.01 mm; G = 0.1 mm; H = 0.02 mm.

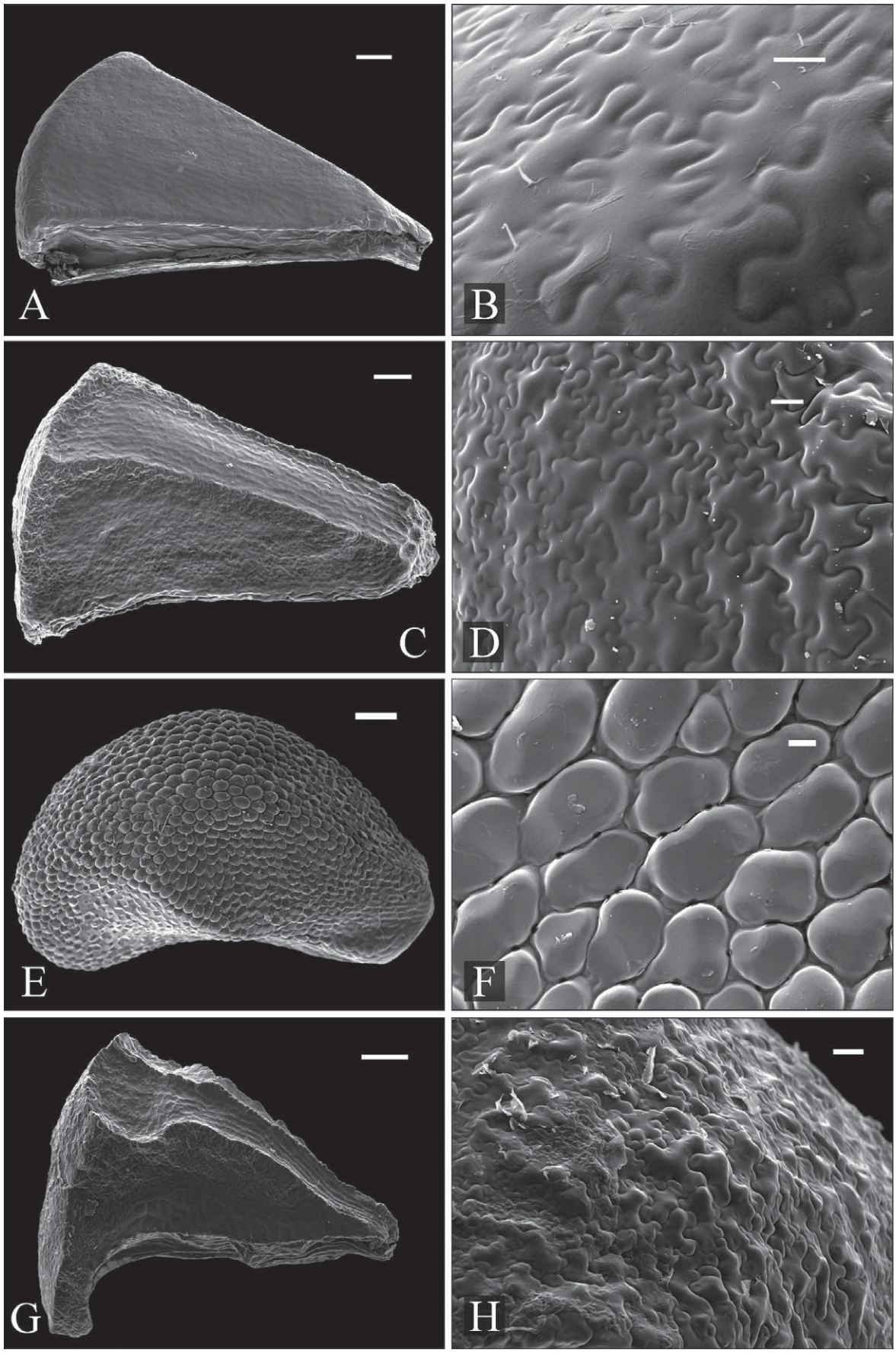

FIGURE 8. A–B, *Charianthus nodosus*; C–D, *Ch. purpureus*; E–F, *Clidemia capitata*; G–H, *C. caudata*. Scale bars: A, C, G = 0.06; B, 0.006; D, F, H = 0.01; E = 0.1 mm.

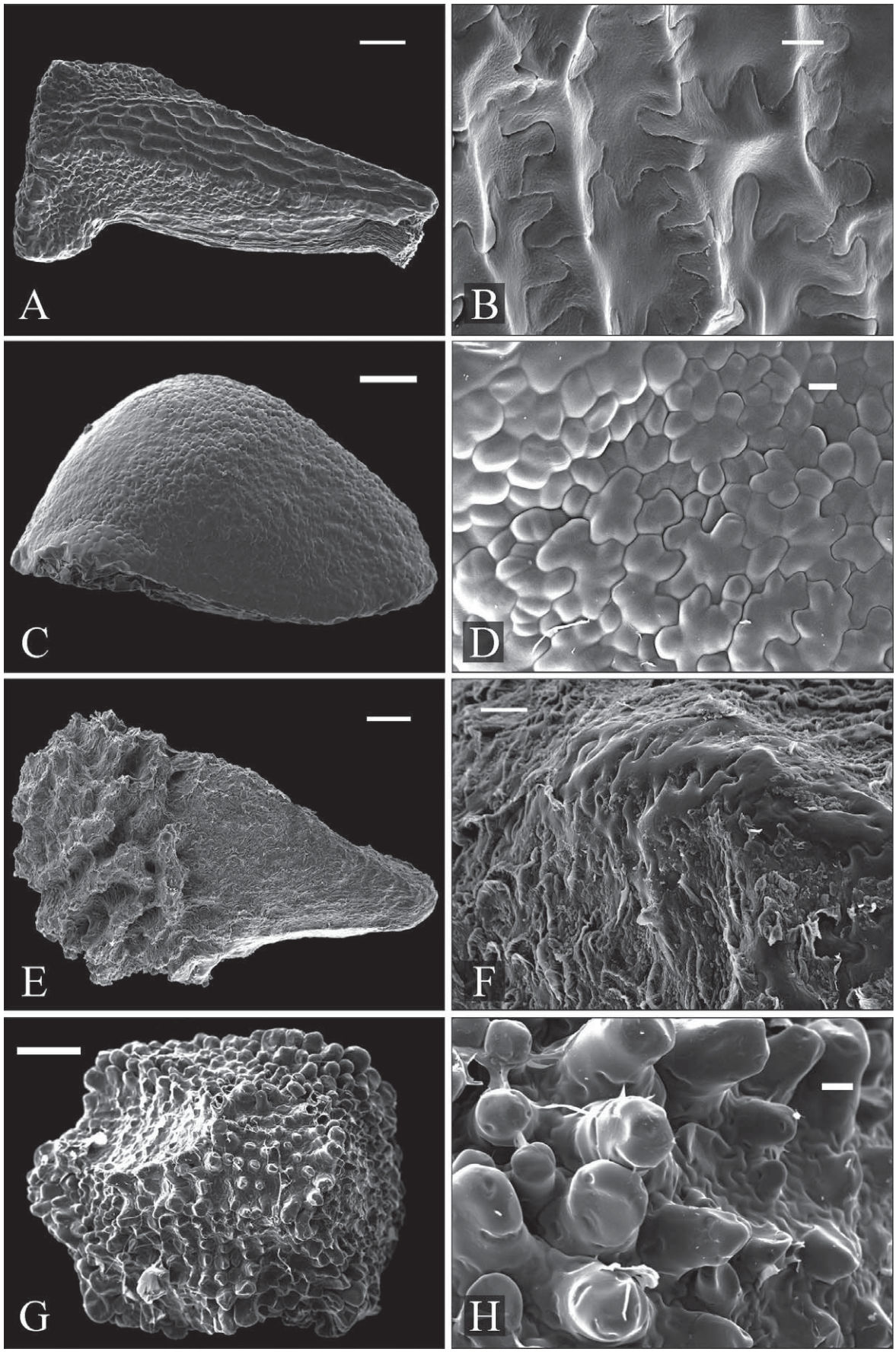

FIGURE 9. A–B, *Clidemia charadrophylla*; C–D, *C. ciliata*; E–F, *C. clandestina*; G–H, *C. crenulata*. Scale bars: A= 0.06 mm; B = 0.006; C, E, G = 0.1 mm; D, H = 0.01 mm; F = 0.02 mm.

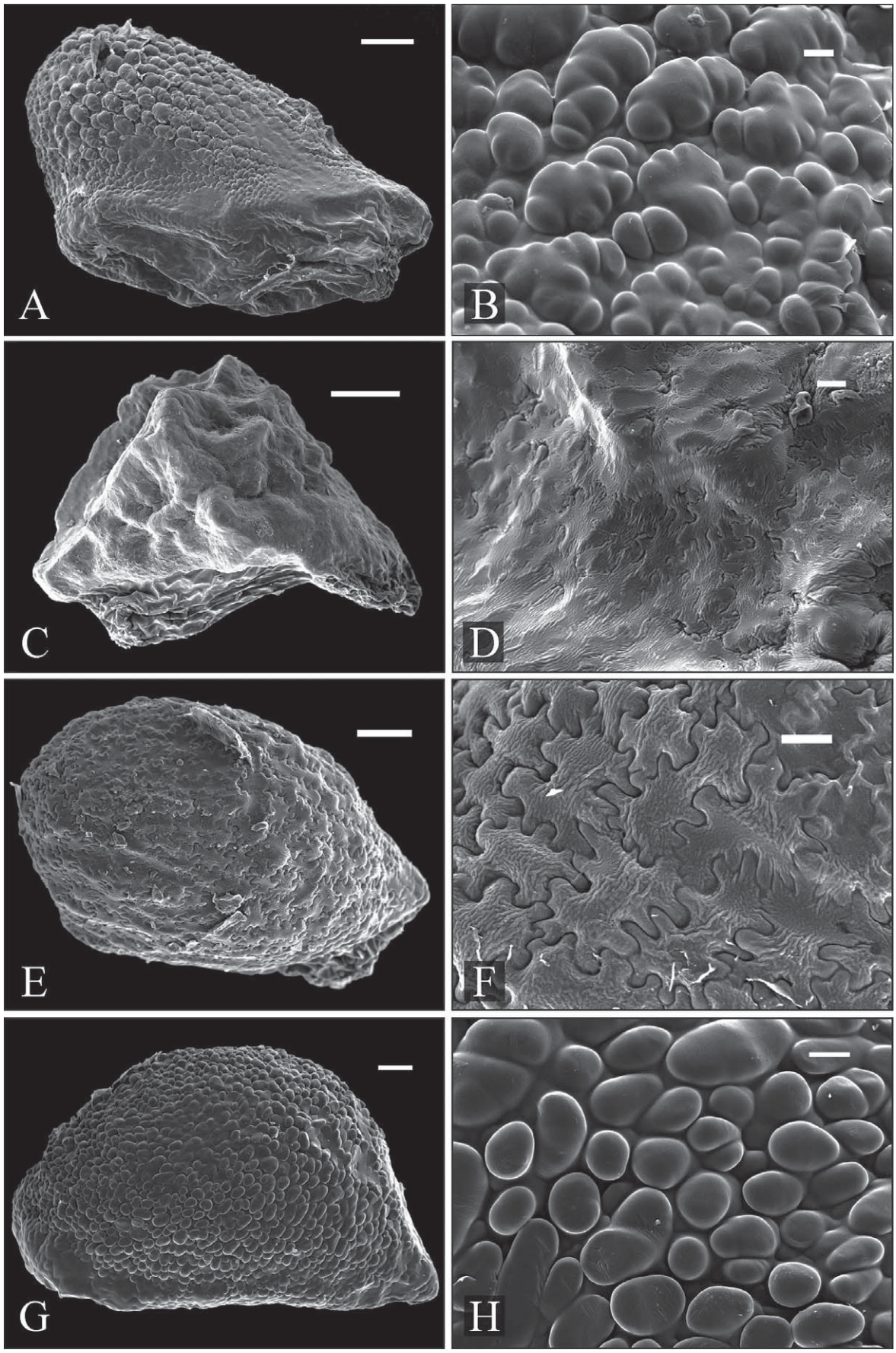

FIGURE 10. A–B, *Clidemia debilis*; C–D, *C. densiflora*; E–F, *C. discolor*; G–H, *C. domingensis*. Scale bars: A, C = 0.1 mm; B, D, F = 0.01 mm; E, G = 0.04 mm; H = 0.009 mm.

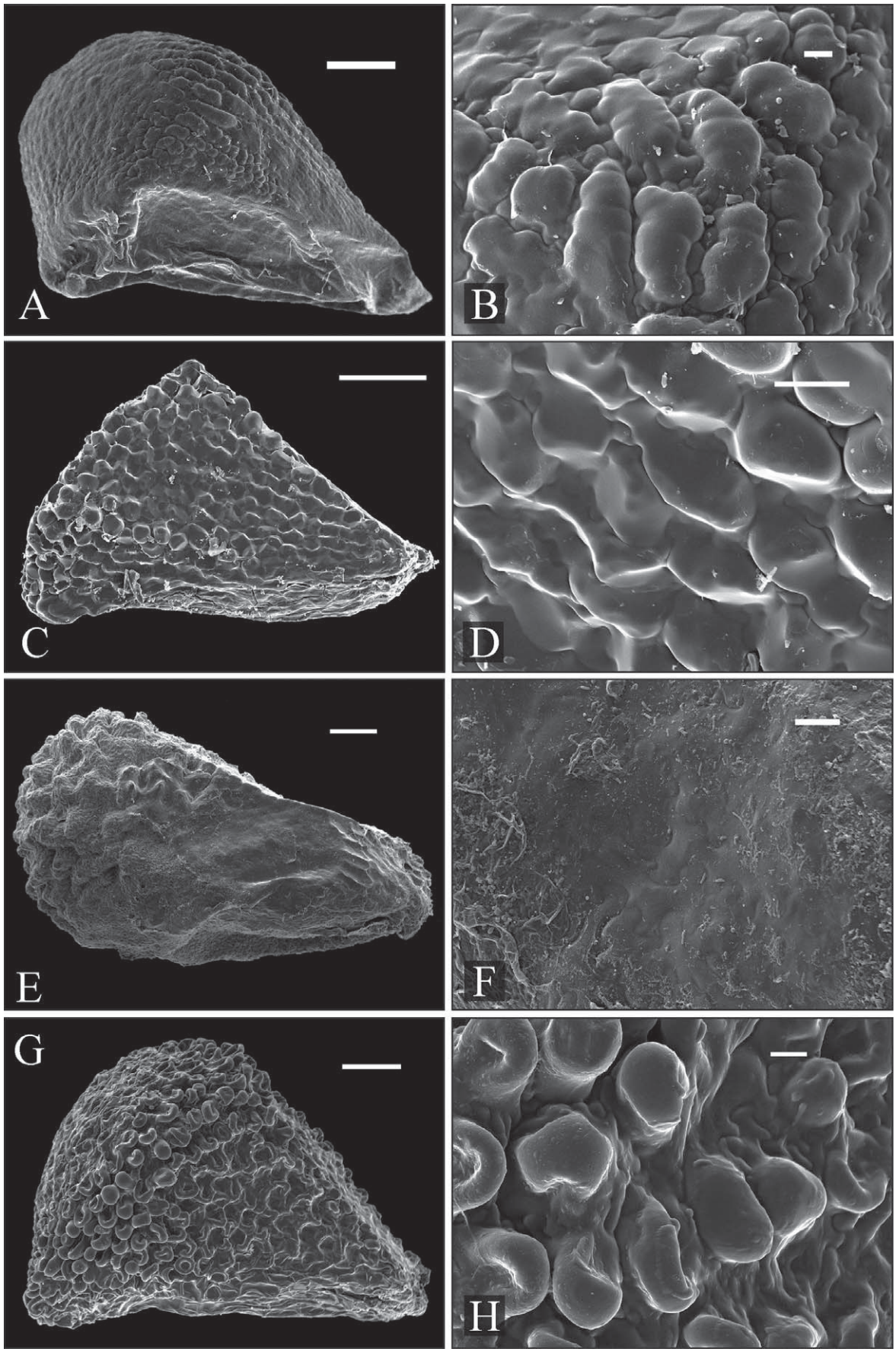

FIGURE 11. A–B, *Clidemia fendleri*; C–D, *C. fraterna;* E–F, *C. garciabarrigae;* G–H, *C. globuliflora*. Scale bars: A, C, E = 0.1 mm; B, D, F, H = 0.01 mm; G = 0.08 mm.

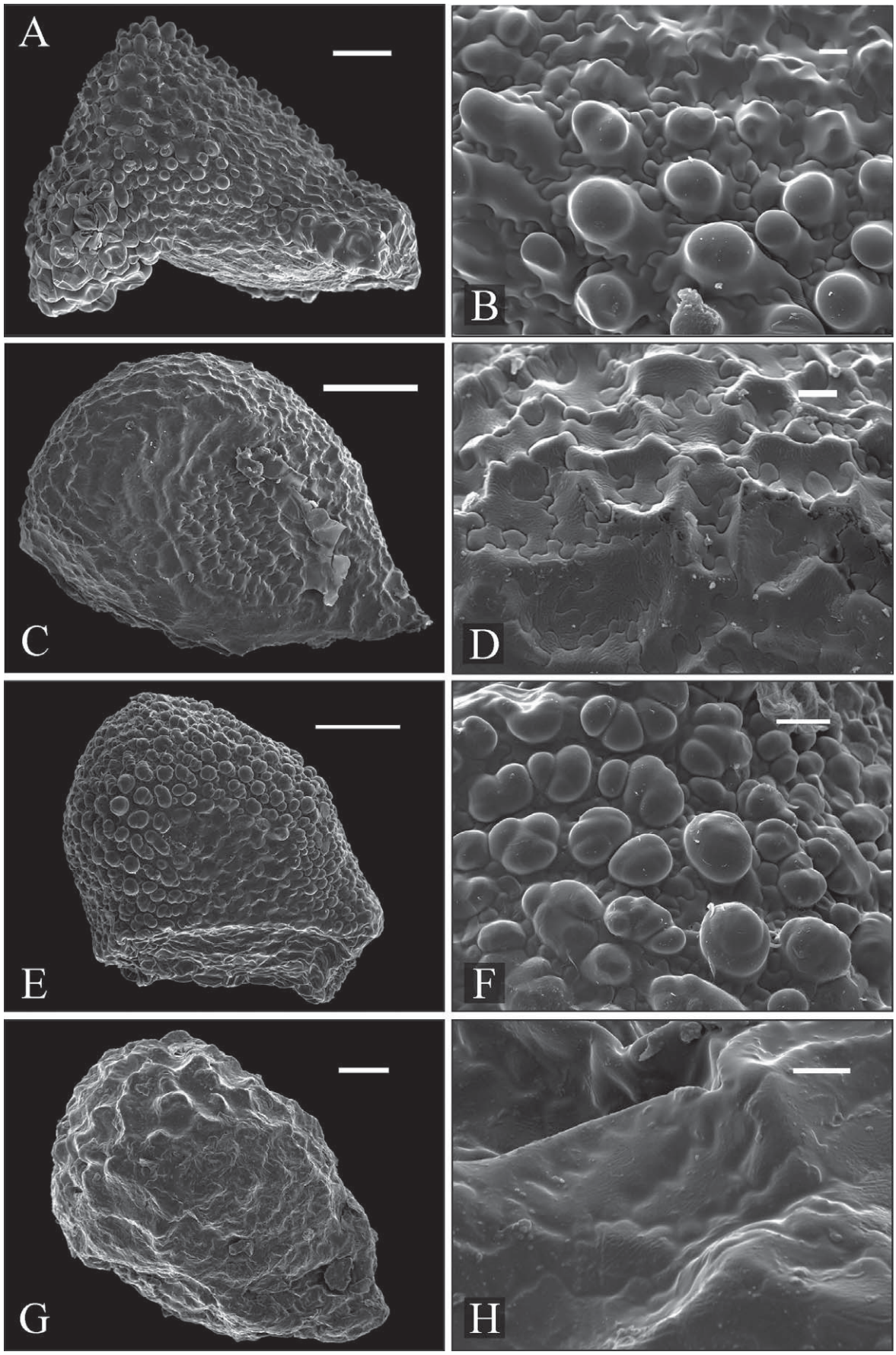

FIGURE 12. A–B, *Clidemia heptamera*; C–D, *C. inobsepta;* E–F, *C. monantha;* G–H, *C. octona.* Scale bars: A, C, E = 0.1 mm; B, D, F = 0.01 mm; G = 0.05 mm; H = 0.008 mm.

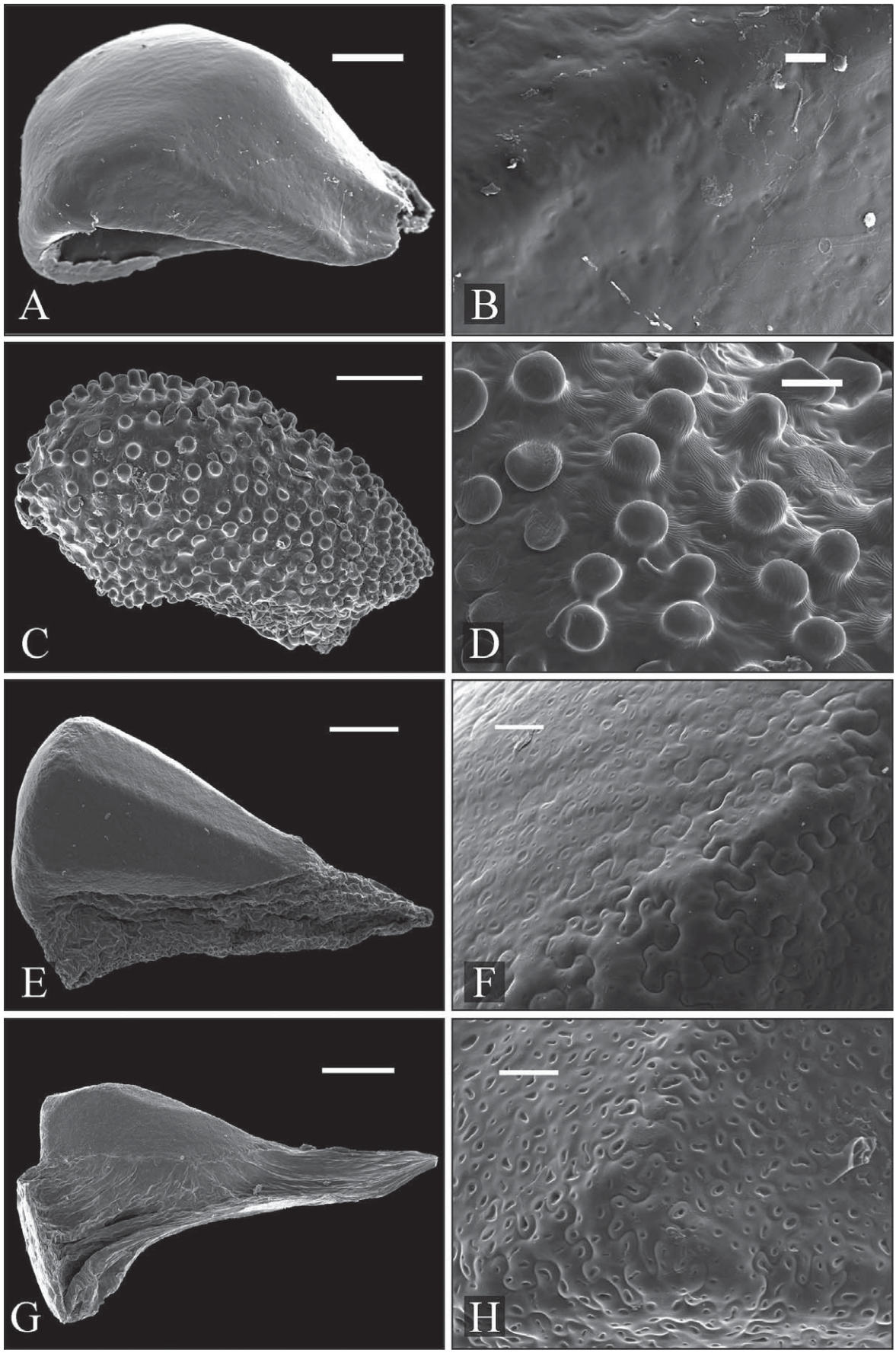

FIGURE 13. A–B, *Clidemia pittieri;* C–D, *C. pustulata;* E–F, *C. quinquenervia;* G–H, *C. reitziana*. Scale bars: A, C, G = 0.1 mm; B, D, H = 0.01 mm; E = 0.08 mm; F = 0.009 mm.

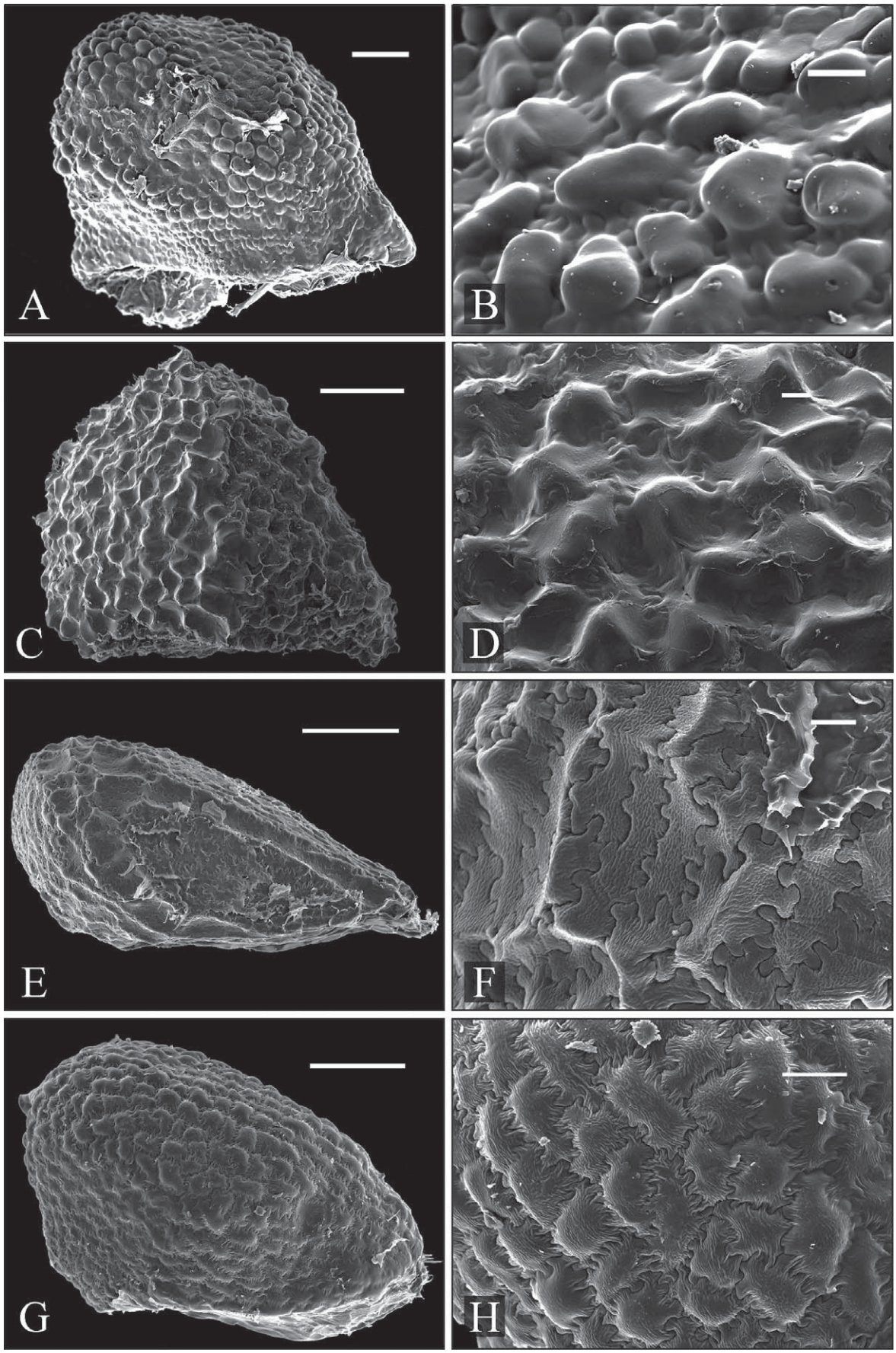

FIGURE 14. A–B, *Clidemia rubra;* C–D, *C. setosa;* E–F, *C. tenebrosa;* G–H, *C. umbellata*. Scale bars: A, C, G = 0.1 mm; B, D = 0.01 mm; E = 0.08 mm; F = 0.009 mm; H = 0.02 mm.

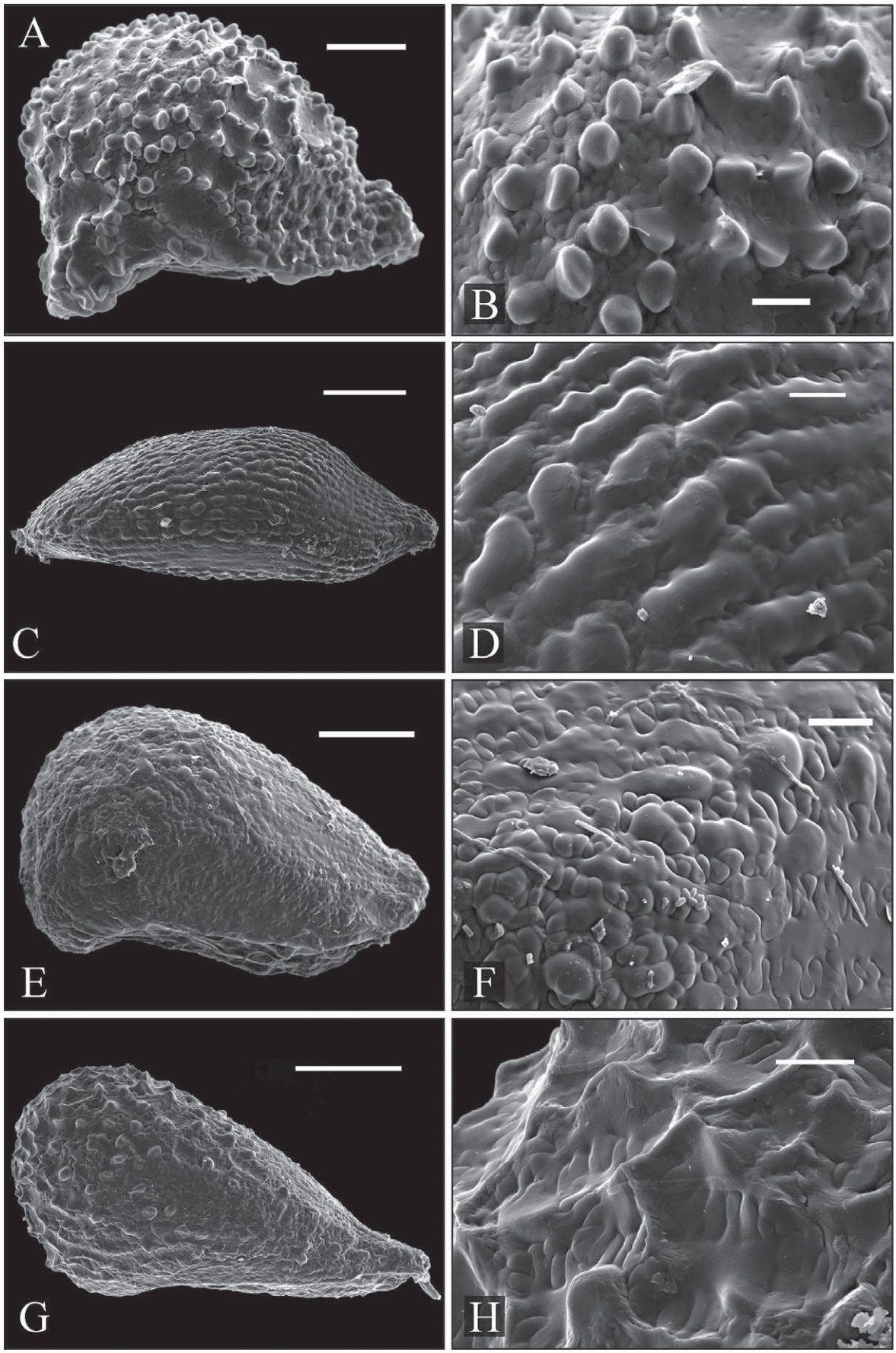

FIGURE 15. A–B, *Clidemia umbrosa;* C–D, *Conostegia bigibbosa;* E–F, *C. centronioides;* G–H, *C. lasiopoda.* Scale bars: A = 0.07 mm; B, F = 0.02 mm; C, E = 0.1 mm; D, H = 0.01 mm; G = 0.08 mm.

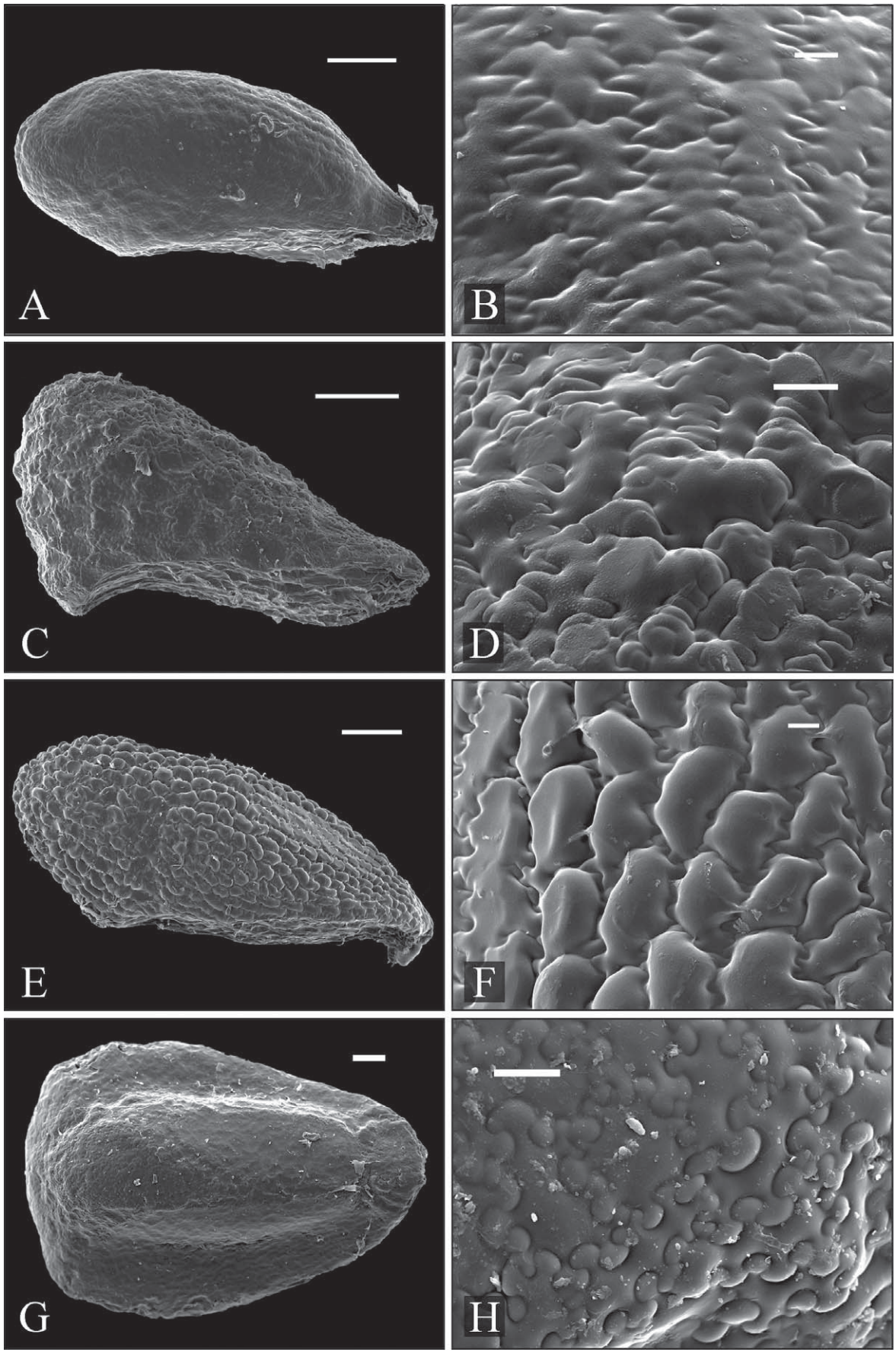

FIGURE 16. A–B, *Conostegia macrantha;* C–D, *C. micrantha;* E–F, *C. oerstediana;* G–H, *C. speciosa.* Figure G in antiraphal view. Scale bars: A, E, G = 0.1 mm; B, F = 0.01 mm; C = 0.08 mm; D = 0.012 mm; H = 0.02 mm.

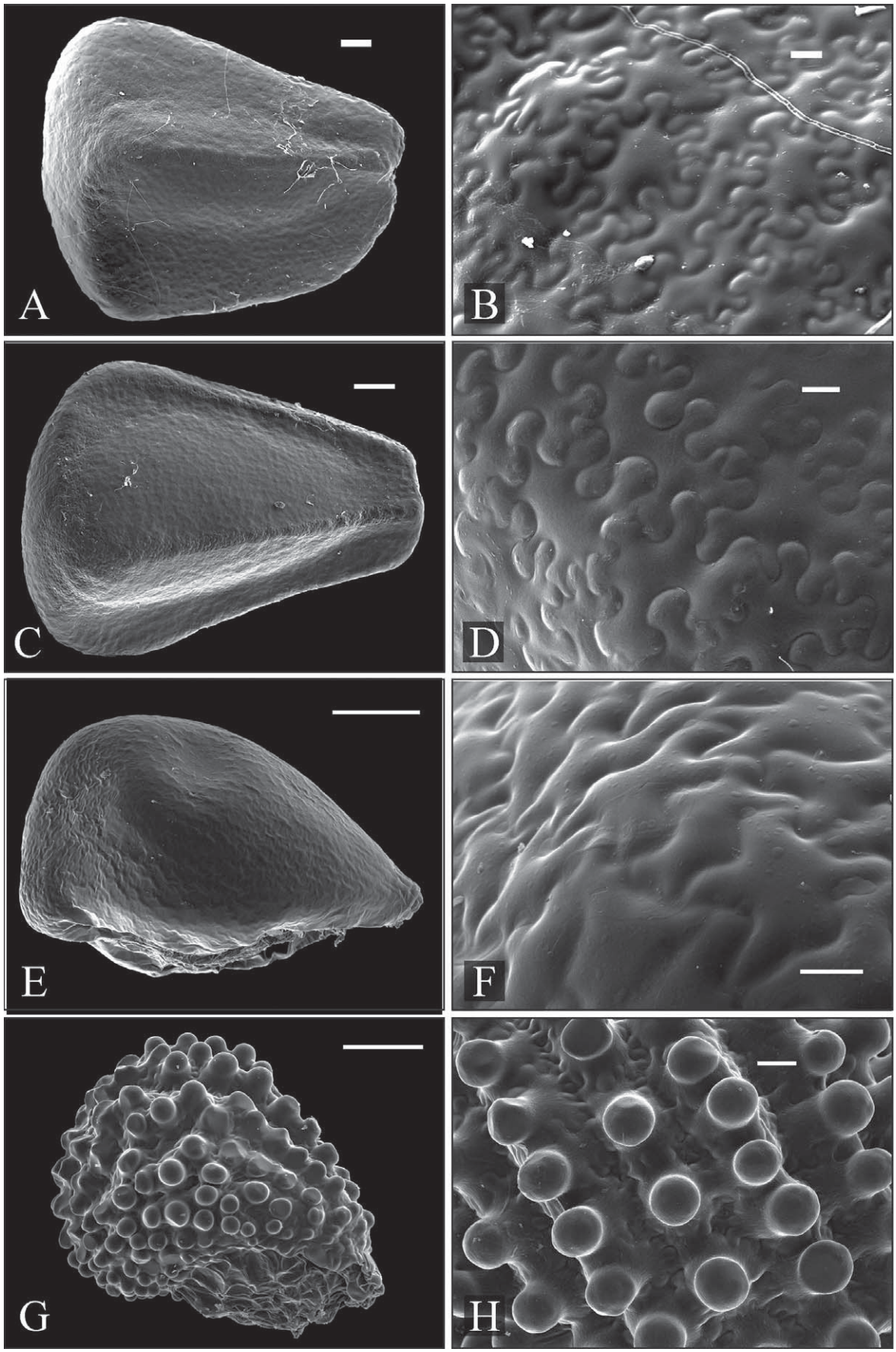

FIGURE 17. A–B, *Conostegia subcrustulata;* C–D, *C. xalapensis;* E–F, *Killipia verticalis;* G–H, *Leandra agrestis.* Figures A and C in antiraphal view. Scale bars: A, C = 0.1 mm; B, D = 0.01 mm; E, G = 0.08 mm; F = 0.005 mm; H = 0.02 mm.

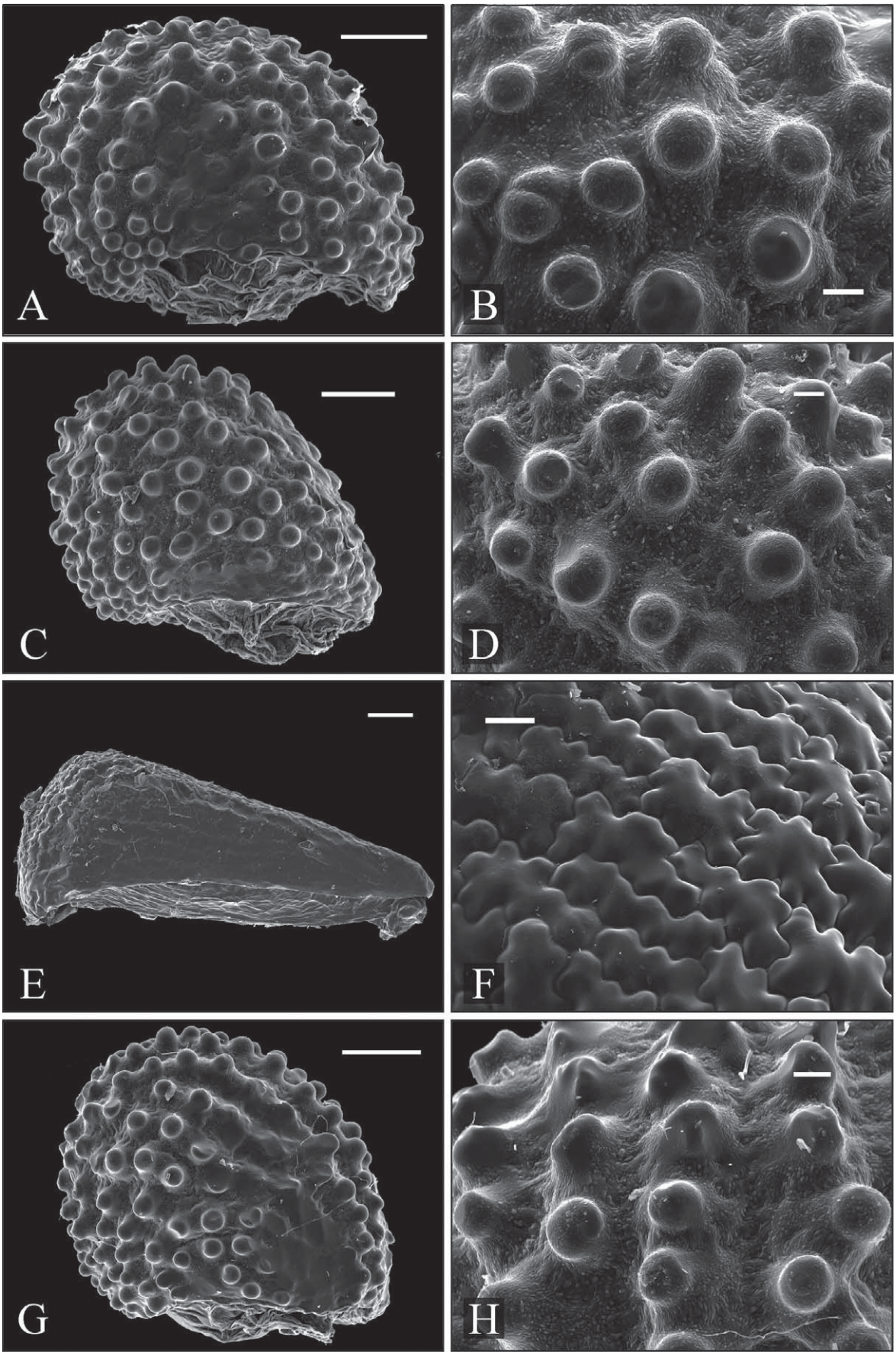

FIGURE 18. A–B, *Leandra dichotoma;* C–D, *L. divaricata;* E–F, *L. fallacissima;* G–H, *L. granatensis.* Scale bars: A, C = 0.06 mm; B, D, H = 0.01 mm; E = 0.1 mm; F = 0.02 mm; G = 0.06 mm.

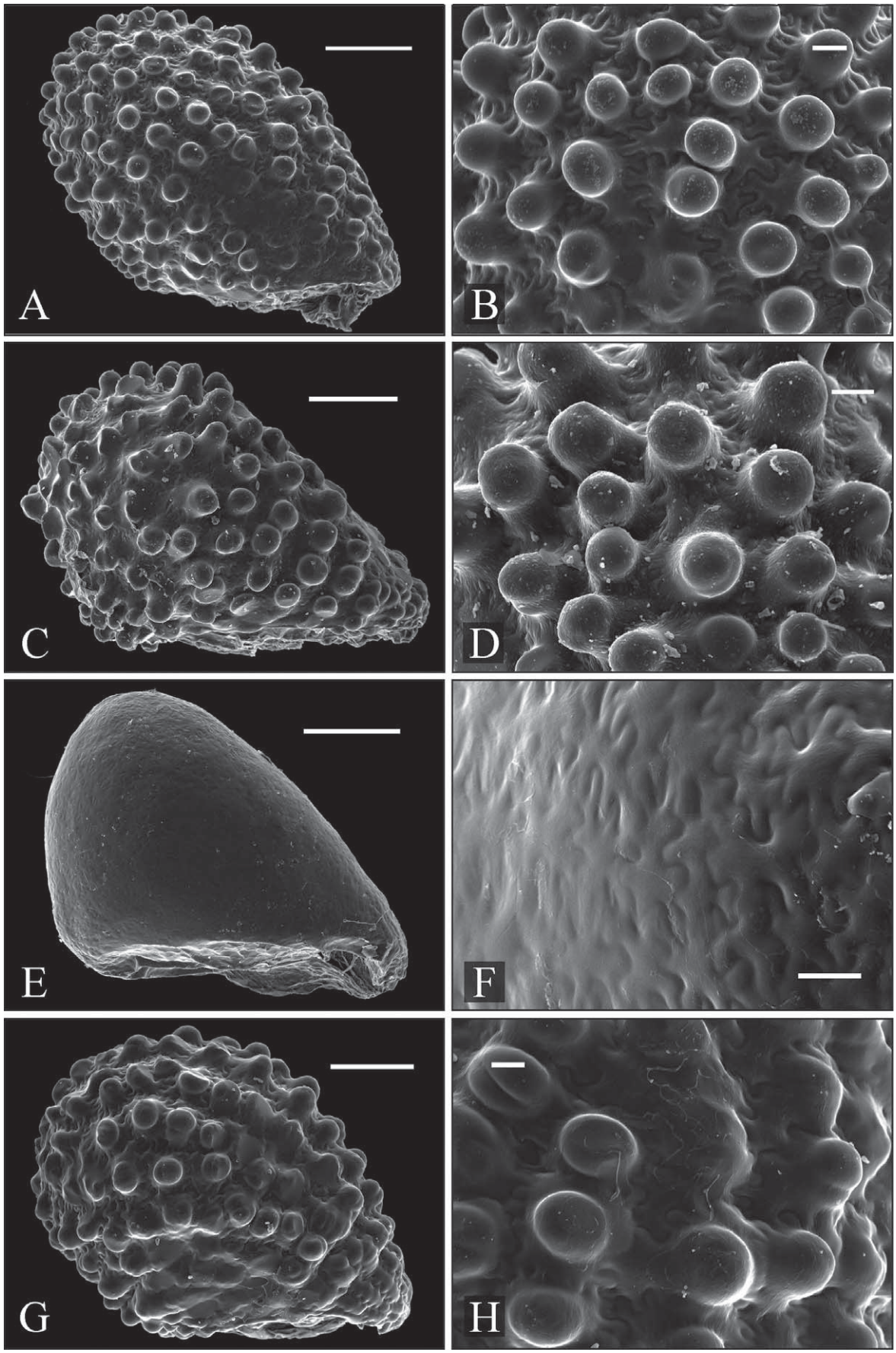

FIGURE 19. A–B, *Leandra longicoma;* C–D, *L. macdanielii;* E–F, *L. melanodesma;* G–H, *L. reversa.* Scale bars: A, E = 0.1 mm; B, D, F, H = 0.01 mm; C, G = 0.06 mm.

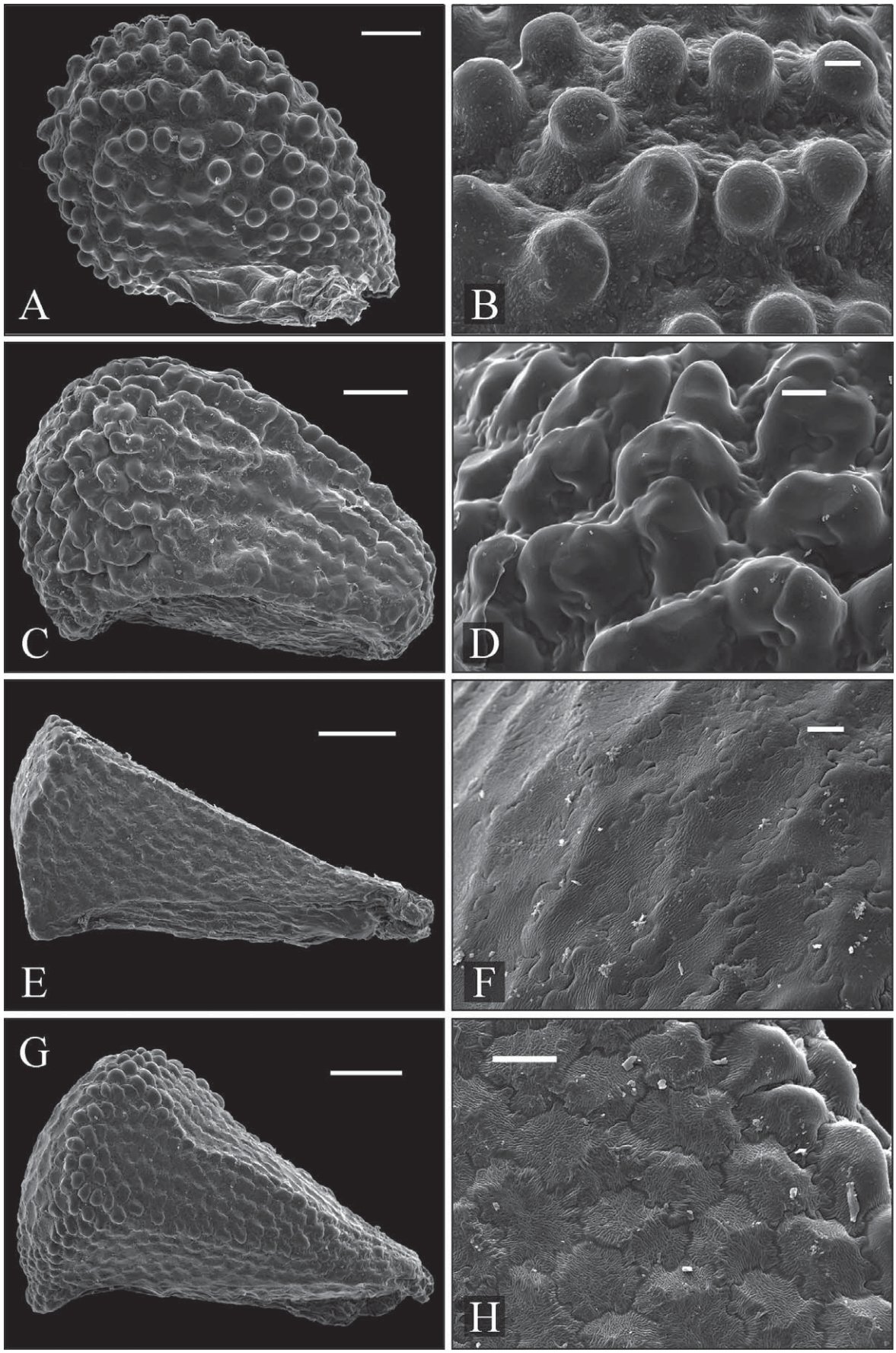

FIGURE 20. A–B, *Leandra rhamnifolia;* C–D, *L. subulata;* E–F, *Maieta guianensis;* G–H, *M. poeppigii*. Scale bars: A = 0.06 mm; B, D, F = 0.01 mm; C, E, G = 0.1 mm; H = 0.02 mm.

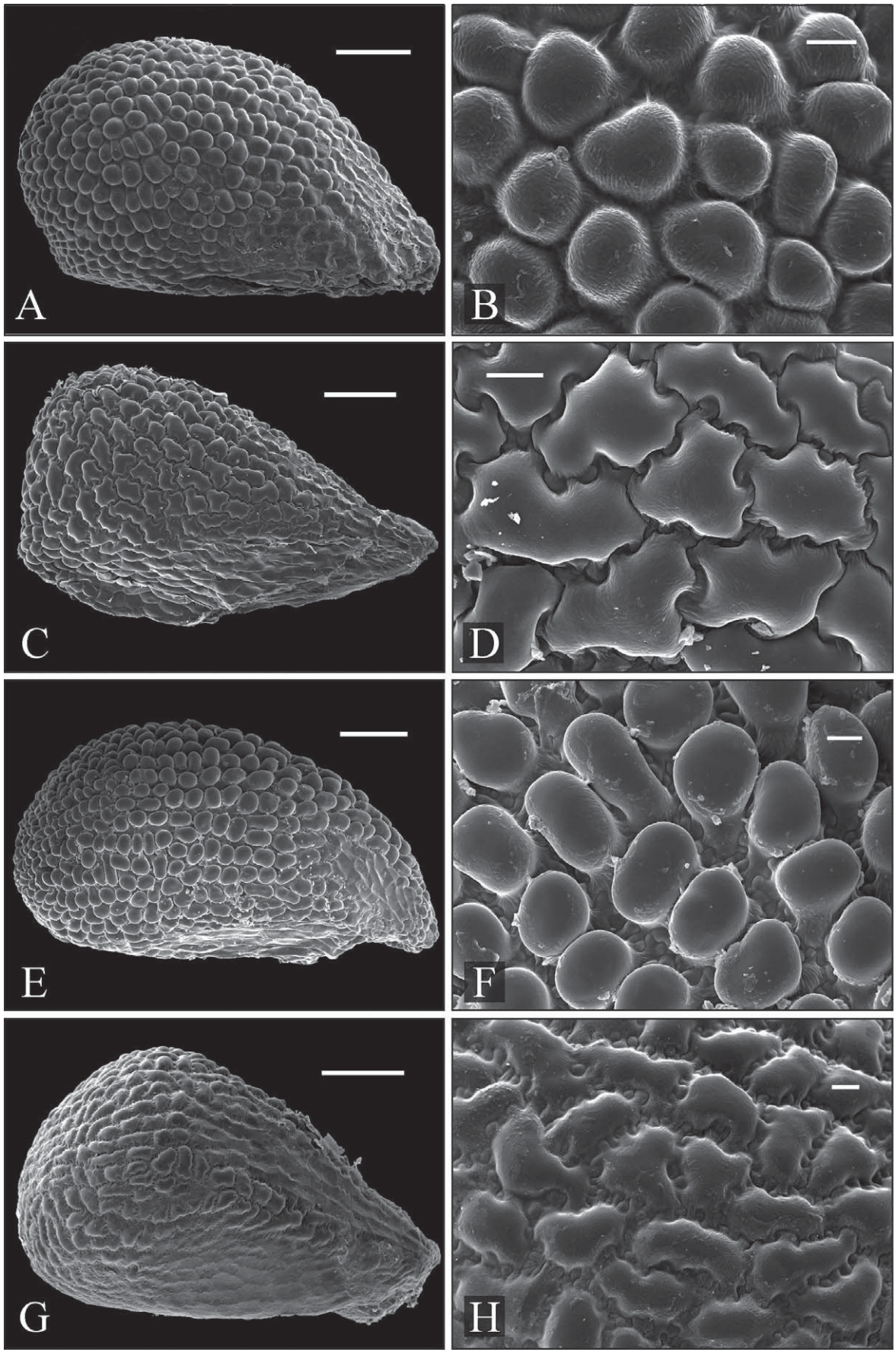

FIGURE 21. A–B, *Mecranium acuminatum;* C–D, *M. haemanthum;* E–F, *M. ovatum;* G–H, *M. septentrionale*. Scale bars: A, C, E = 0.08 mm; B, D = 0.012 mm; F, H = 0.01 mm; G = 0.1 mm.

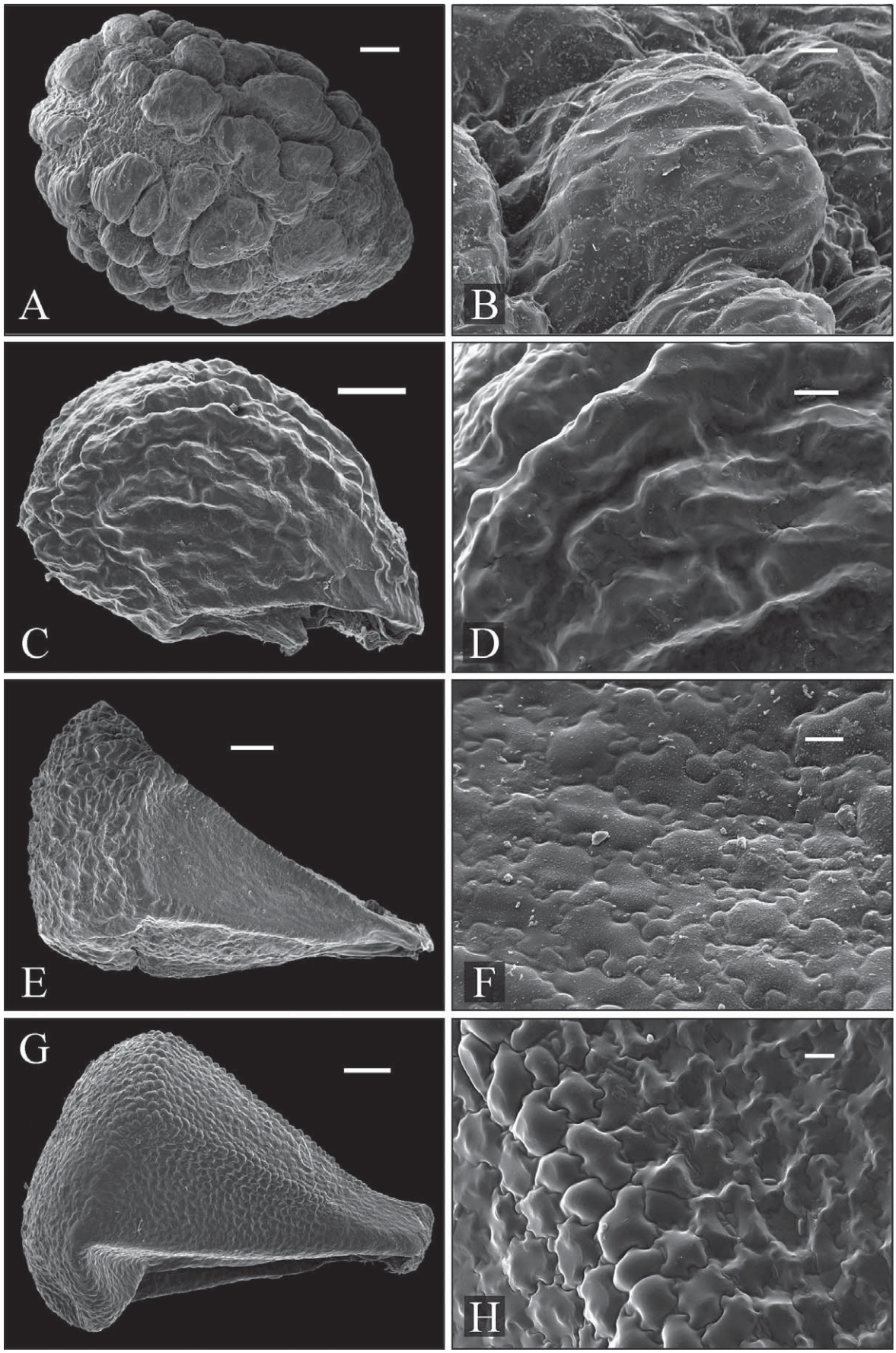

FIGURE 22. A–B, *Miconia acuminata;* C–D, *M. aeruginosa;* E–F, *M. affinis;* G–H, *M. alata*. Scale bars: A, E = 0.1 mm; B, D = 0.02 mm; C, G = 0.09 mm; F, H = 0.01 mm.

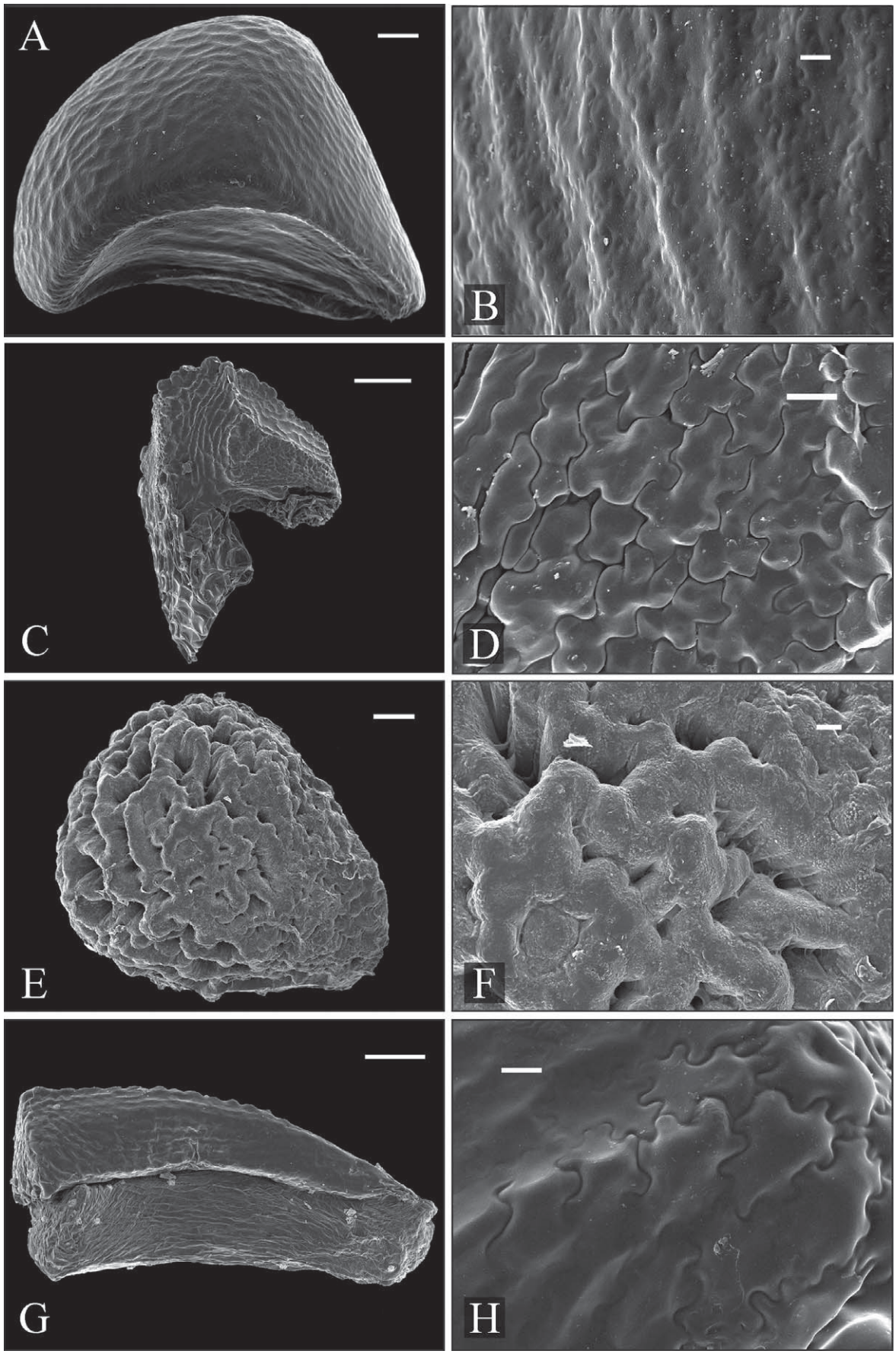

FIGURE 23. A–B, *Miconia albicans;* C–D, *M. aliquantula;* E–F, *M. amplinodis;* G–H, *M. anderssonii*. Scale bars: A, C, E, G = 0.1 mm; B, D, H = 0.01 mm; F = 0.02 mm.

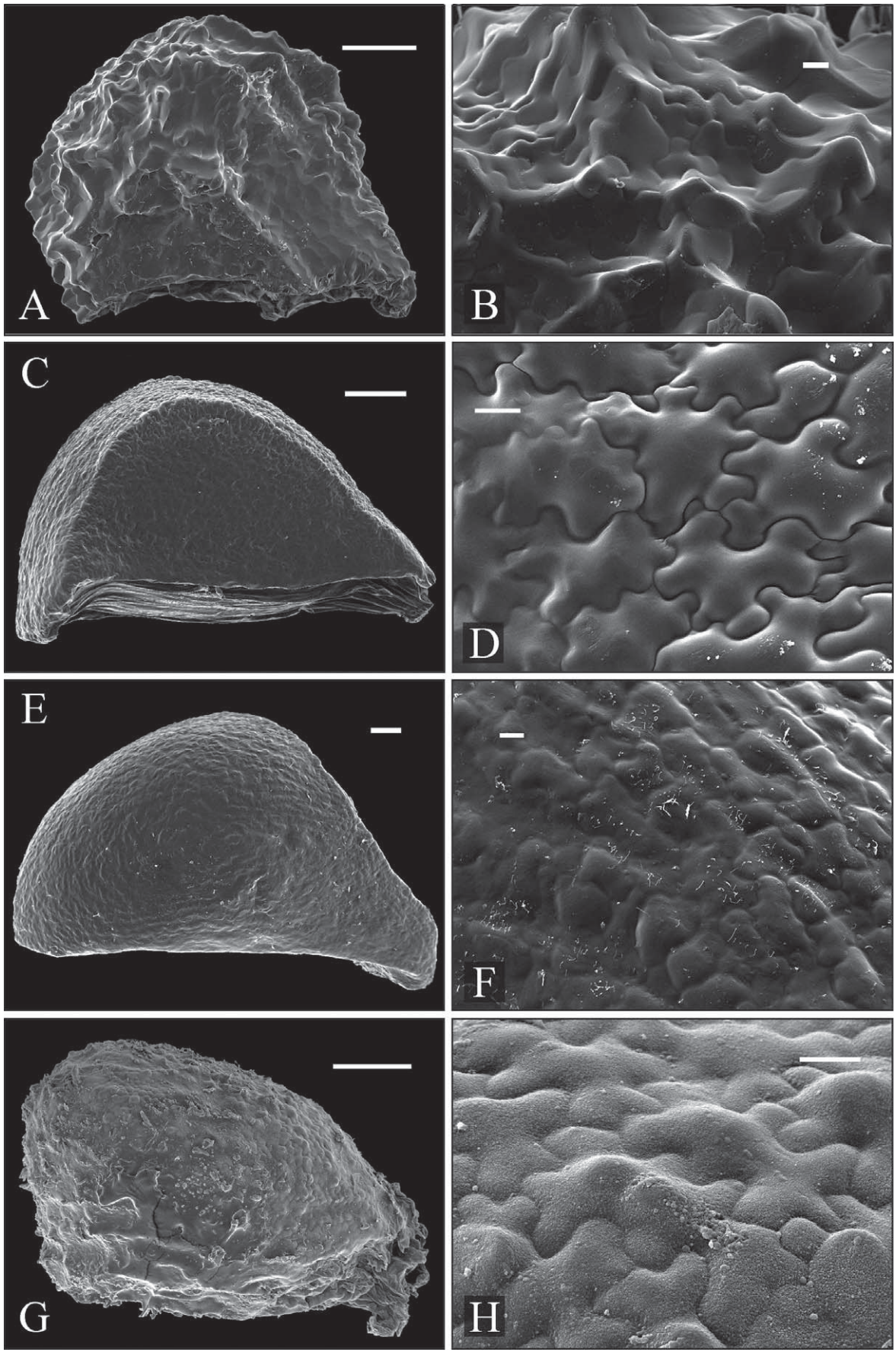

FIGURE 24. A–B, *Miconia arboricola;* C–D, *M. argentea;* E–F, *M. argyrophylla;* G–H, *M. asclepiadea.* Scale bars: A, E = 0.1 mm; B, F = 0.01 mm; C = 0.12 mm; D = 0.009 mm; G = 0.08 mm; H = 0.008 mm.

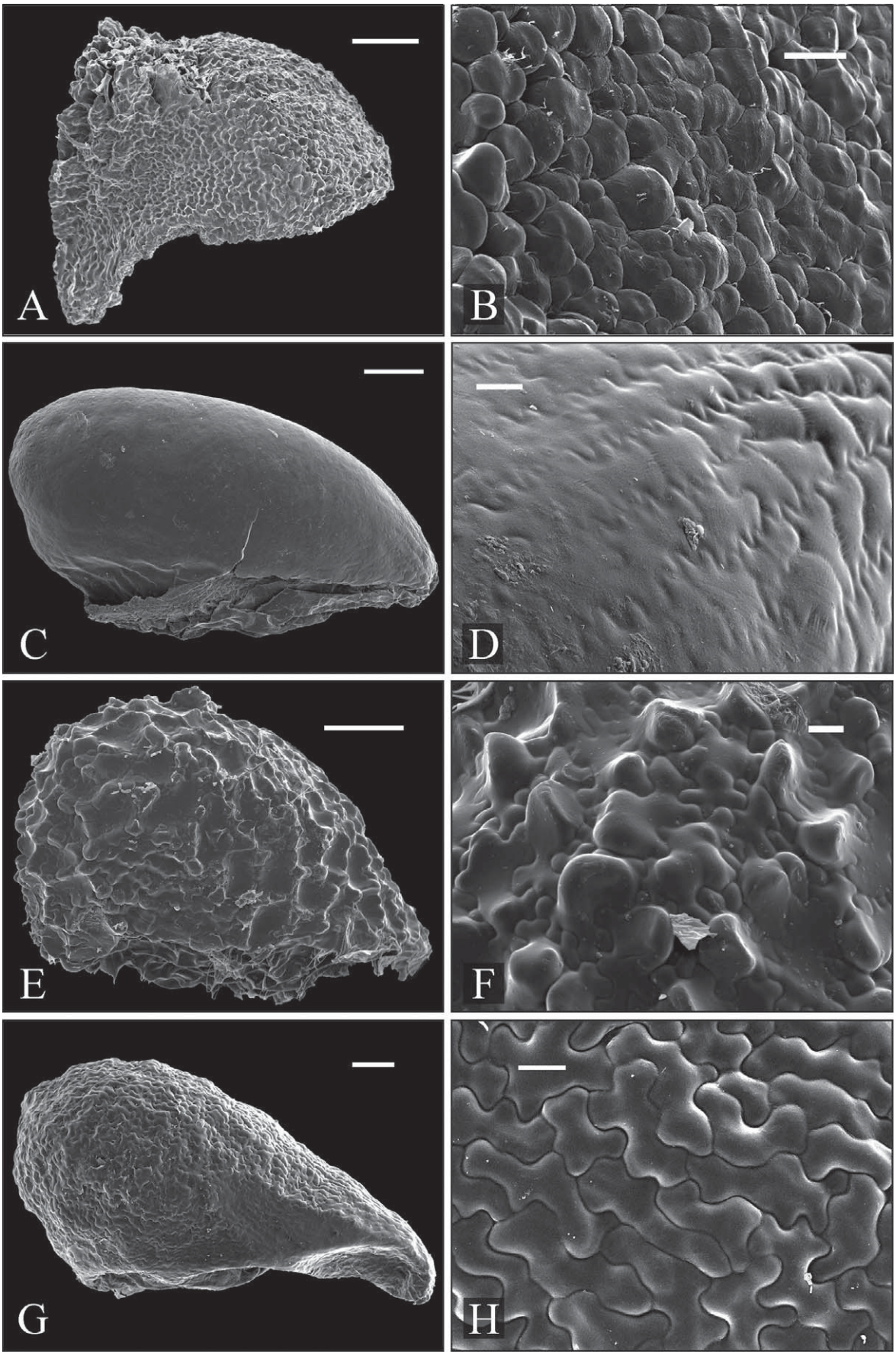

FIGURE 25. A–B, *Miconia astroplocama;* C–D, *M. aymardii;* E–F, *M. benthamiana;* G–H, *M. biperulifera*. Scale bars: A = 0.2 mm; B = 0.03 mm; C = 0.08 mm; D = 0.009 mm; E = 0.06 mm; F = 0.01 mm; G = 0.1 mm; H = 0.02 mm.

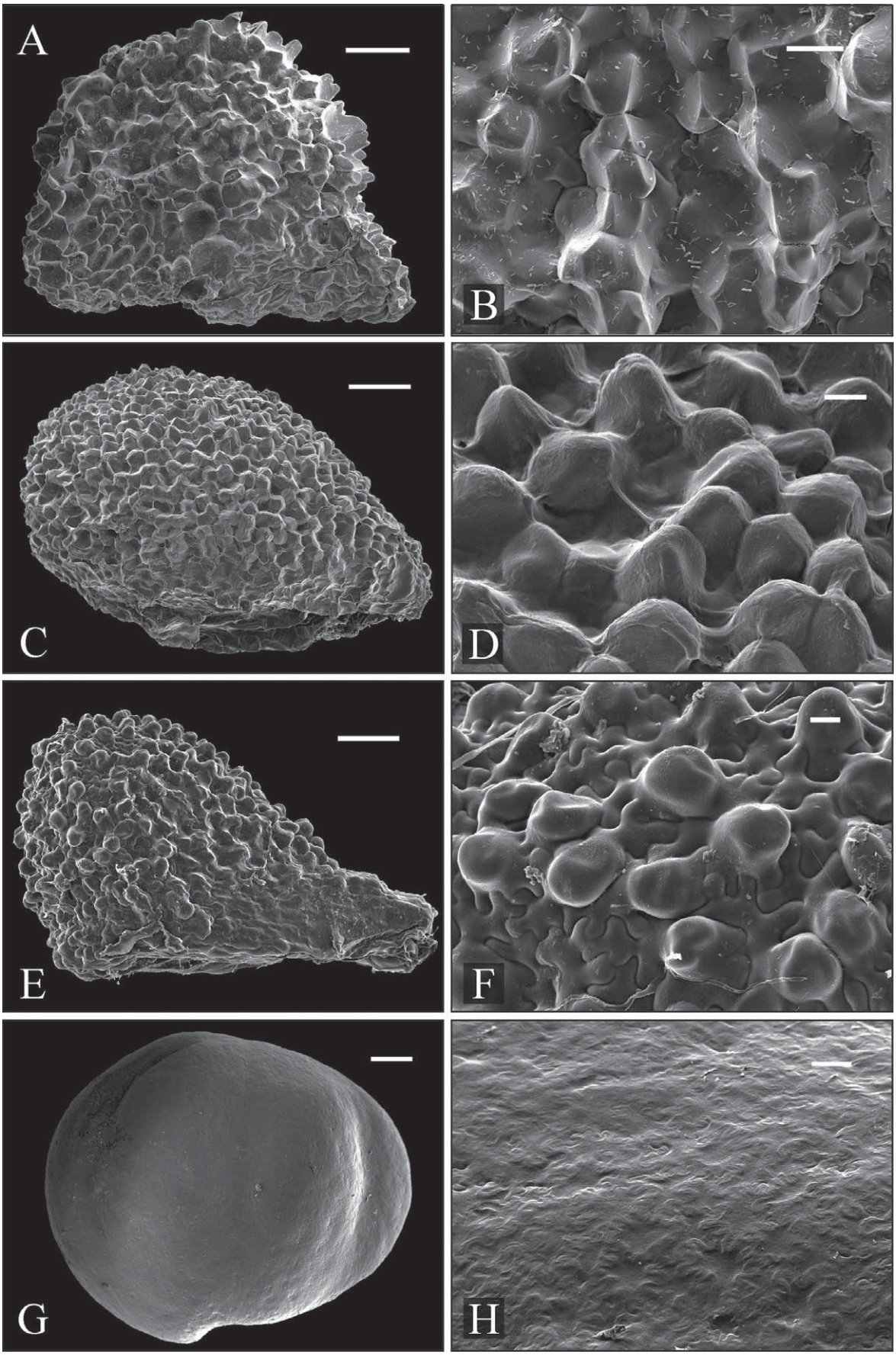

FIGURE 26. A–B, *Miconia brachybotrya;* C–D, *M. bracteolata;* E–F, *M. brevitheca;* G–H, *M. brunnea.* Figure G in antiraphal view. Scale bars: A, E = 0.08 mm; B = 0.02 mm; C = 0.1 mm; D, F = 0.01 mm; E = 0.08 mm; G = 0.5 mm; H = 0.03 mm.

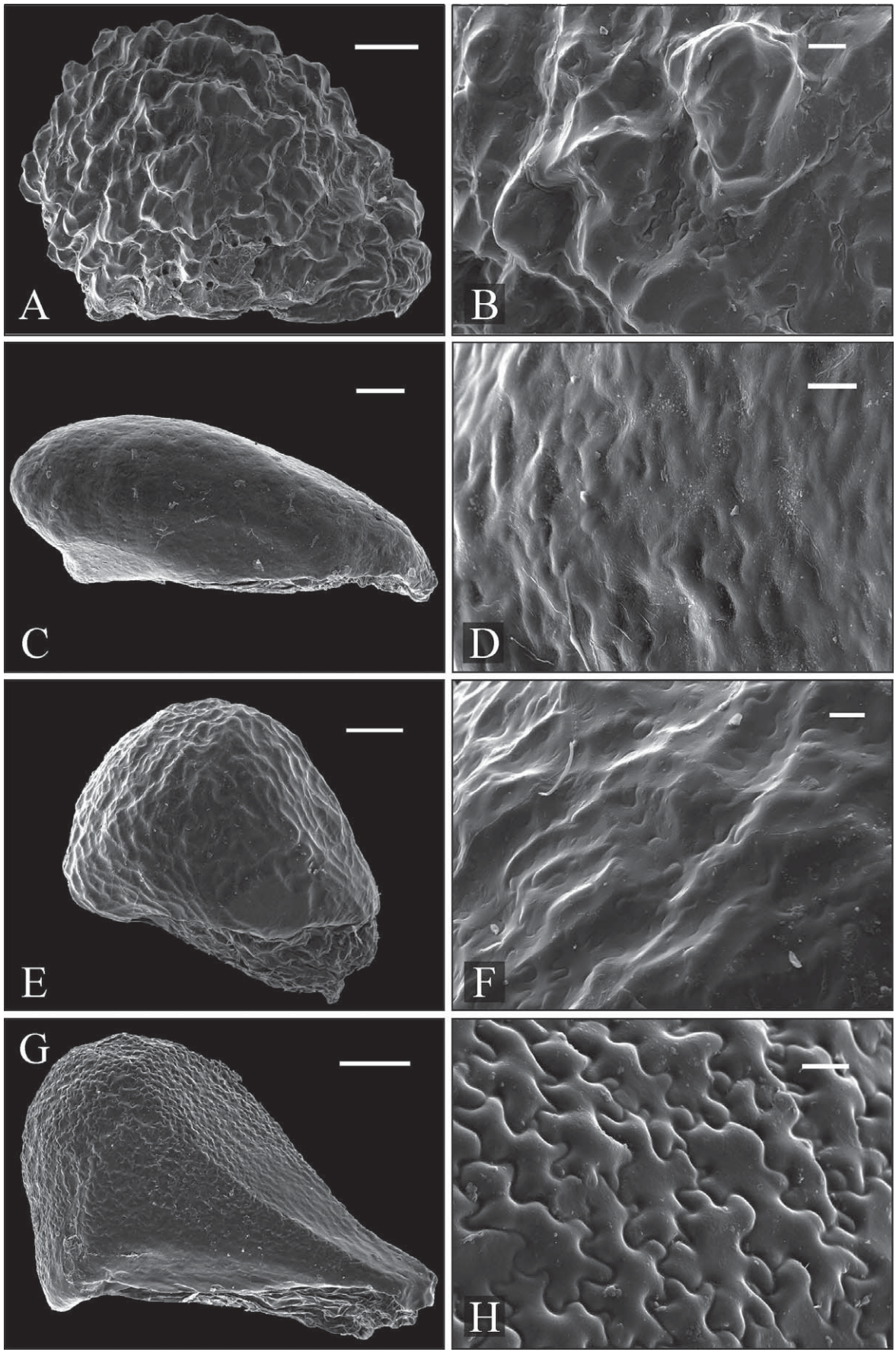

FIGURE 27. A–B, *Miconia bubalina;* C–D, *M. bullata;* E–F, *M. calvescens;* G–H, *M. calycina*. Scale bars: A, C, E, G = 0.1 mm; B = 0.02 mm; D = 0.009 mm; F, H = 0.01 mm.

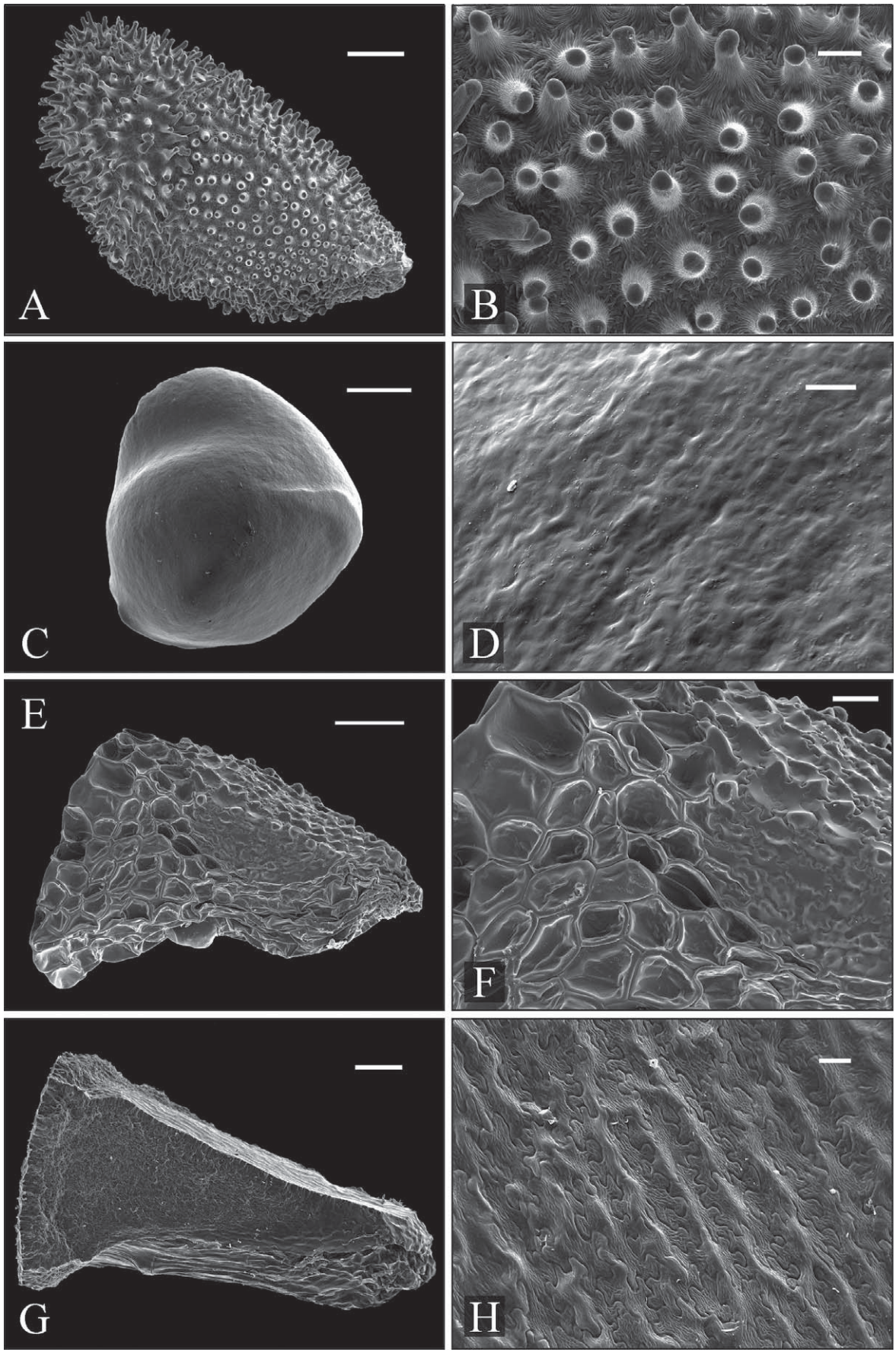

FIGURE 28. A–B, *Miconia campestris;* C–D, *M. caudigera;* E–F, *M. centrodesma;* G–H, *M. cercophora*. Figure C in antiraphal view. Scale bars: A, E = 0.1 mm; B = 0.02 mm; C = 0.5 mm; D, F = 0.03 mm; G = 0.09 mm; H = 0.01 mm.

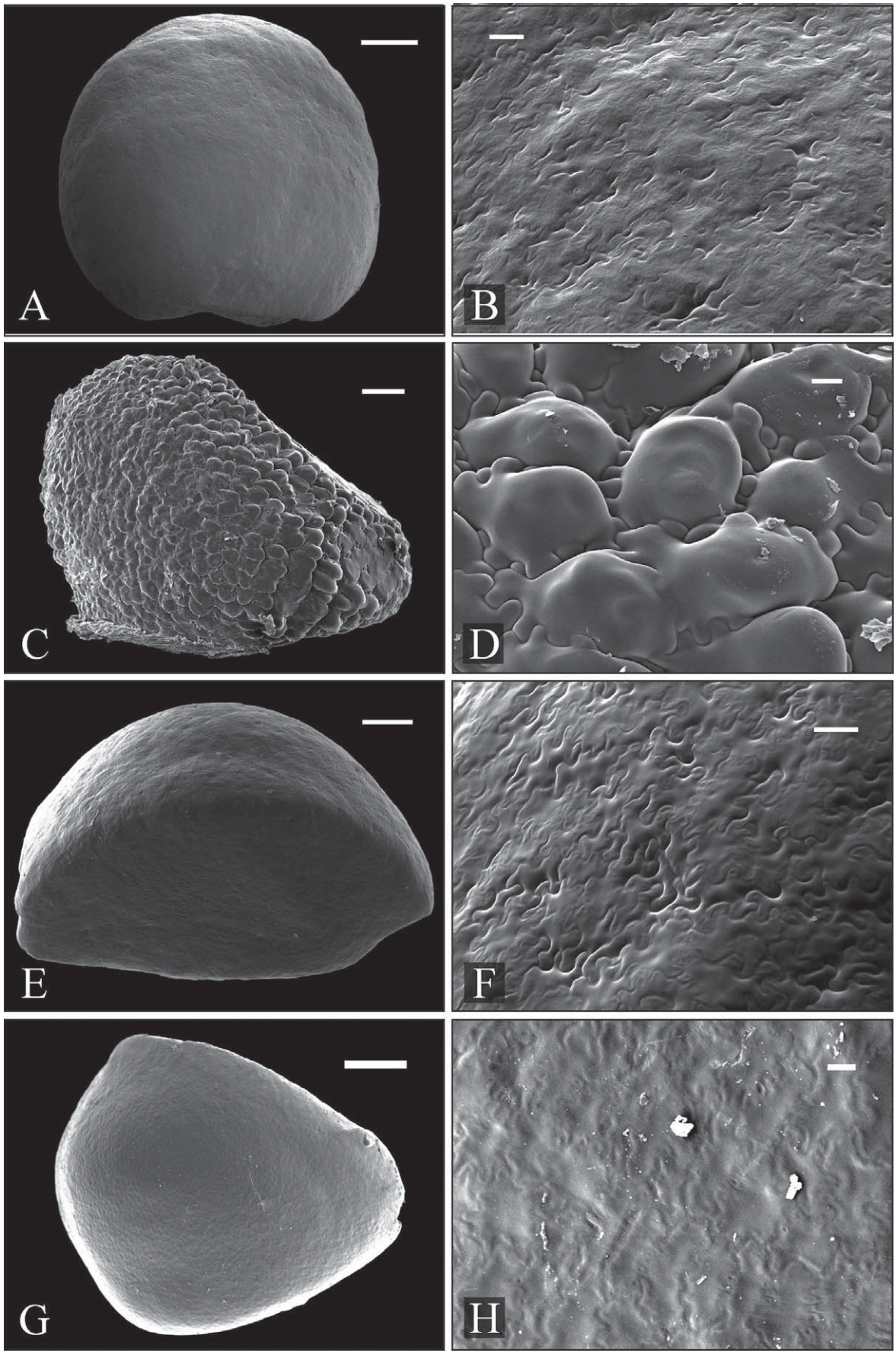

FIGURE 29. A–B, *Miconia chartacea;* C–D, *M. chionophila;* E–F, *M. chrysophylla;* G–H, *M. cinerascens*. Figure G in antiraphal view. Scale bars: A = 0.6 mm; B = 0.03 mm; C = 0.1 mm; D, H = 0.01 mm; E, G = 0.3 mm; F = 0.02 mm.

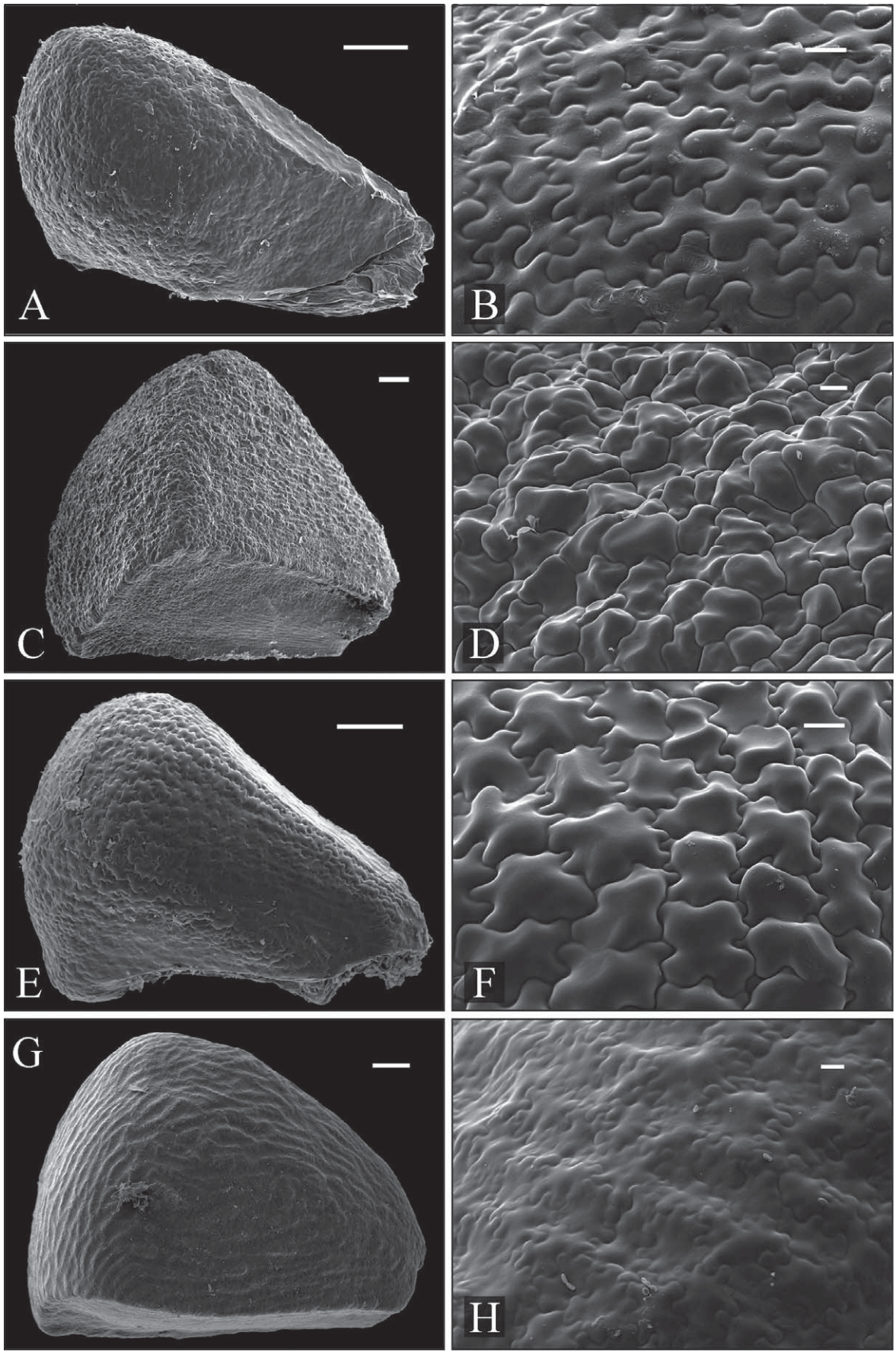

FIGURE 30. A–B, *Miconia costaricensis;* C–D, *M. crassinervia;* E–F, *M. cubensis;* G–H, *M. cuspidata*. Scale bars: A, C, G = 0.1 mm; B, D, F, H = 0.01 mm; E = 0.08 mm.

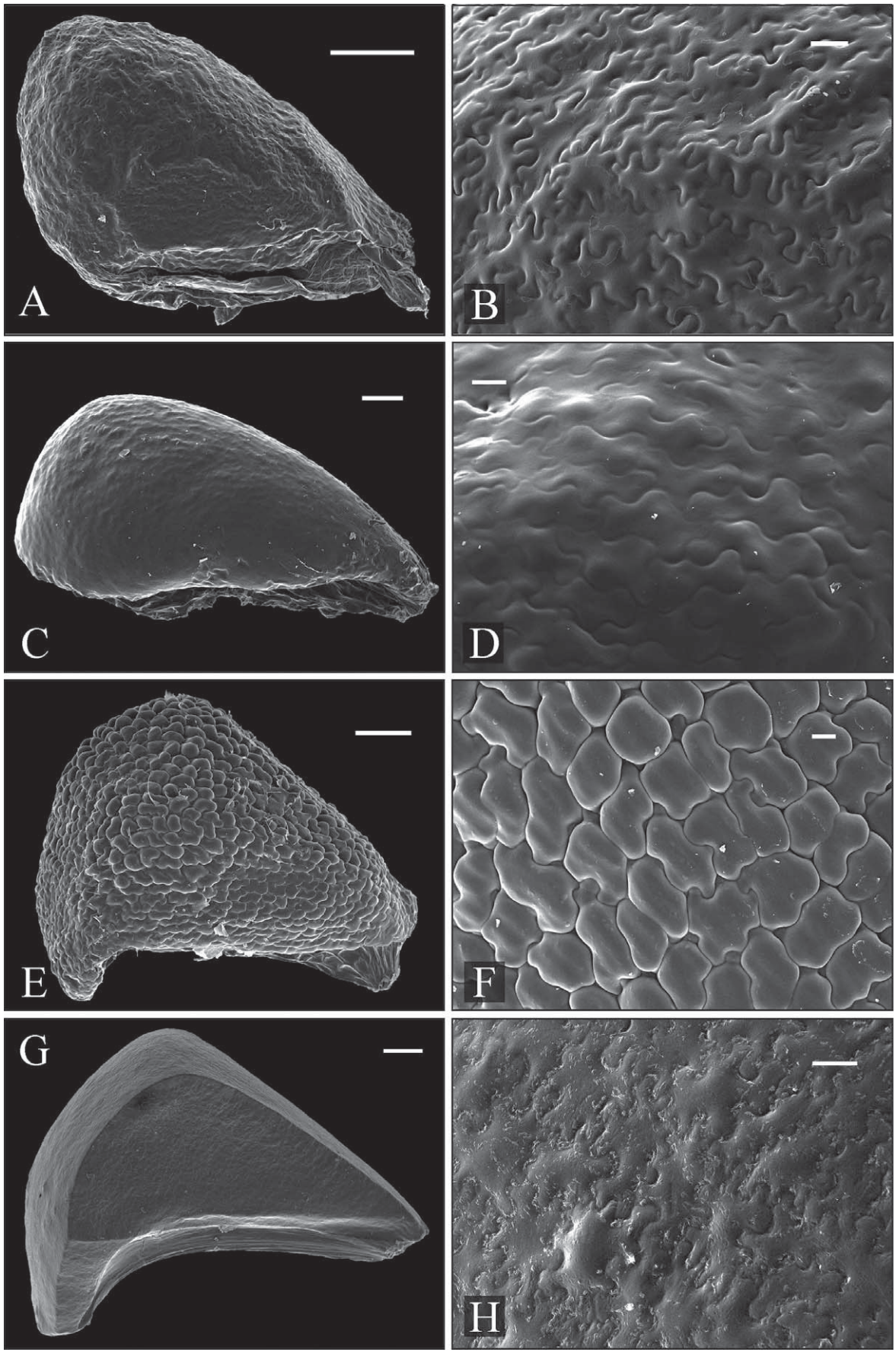

FIGURE 31. A–B, *Miconia denticulata;* C–D, *M. desportesii;* E–F, *M. dielsiana;* G–H, *M. dispar*. Scale bars: A, E, G = 0.1 mm; B, D, F, H = 0.01 mm; C = 0.09 mm.

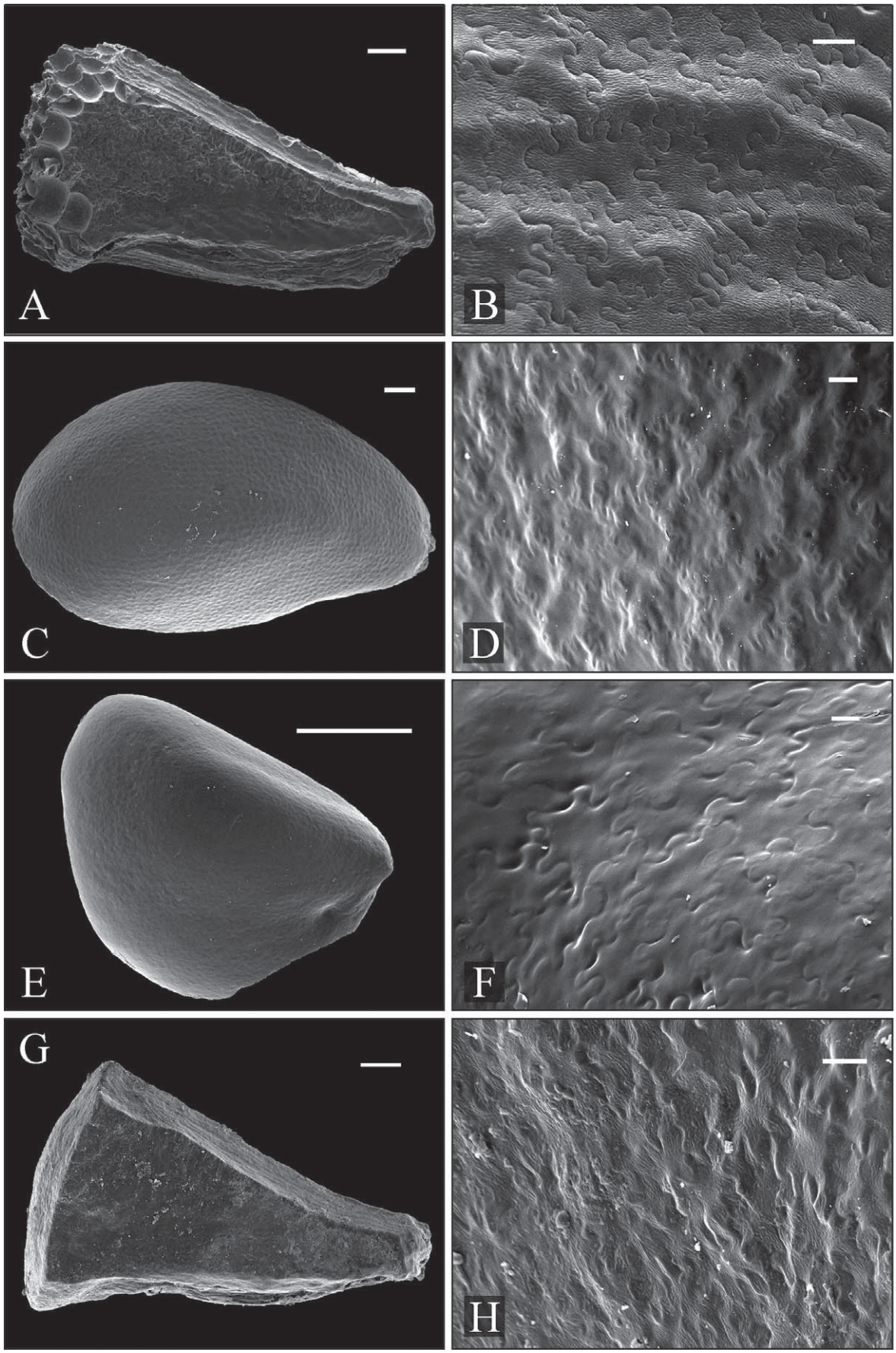

FIGURE 32. A–B, *Miconia dodecandra;* C–D, *M. dolichopoda;* E–F, *M. dolichorrhyncha;* G–H, *M. donaeana.* Figures C and E in antiraphal view. Scale bars: A, C, G = 0.1 mm; B, D, F, H = 0.01 mm; E = 0.5 mm.

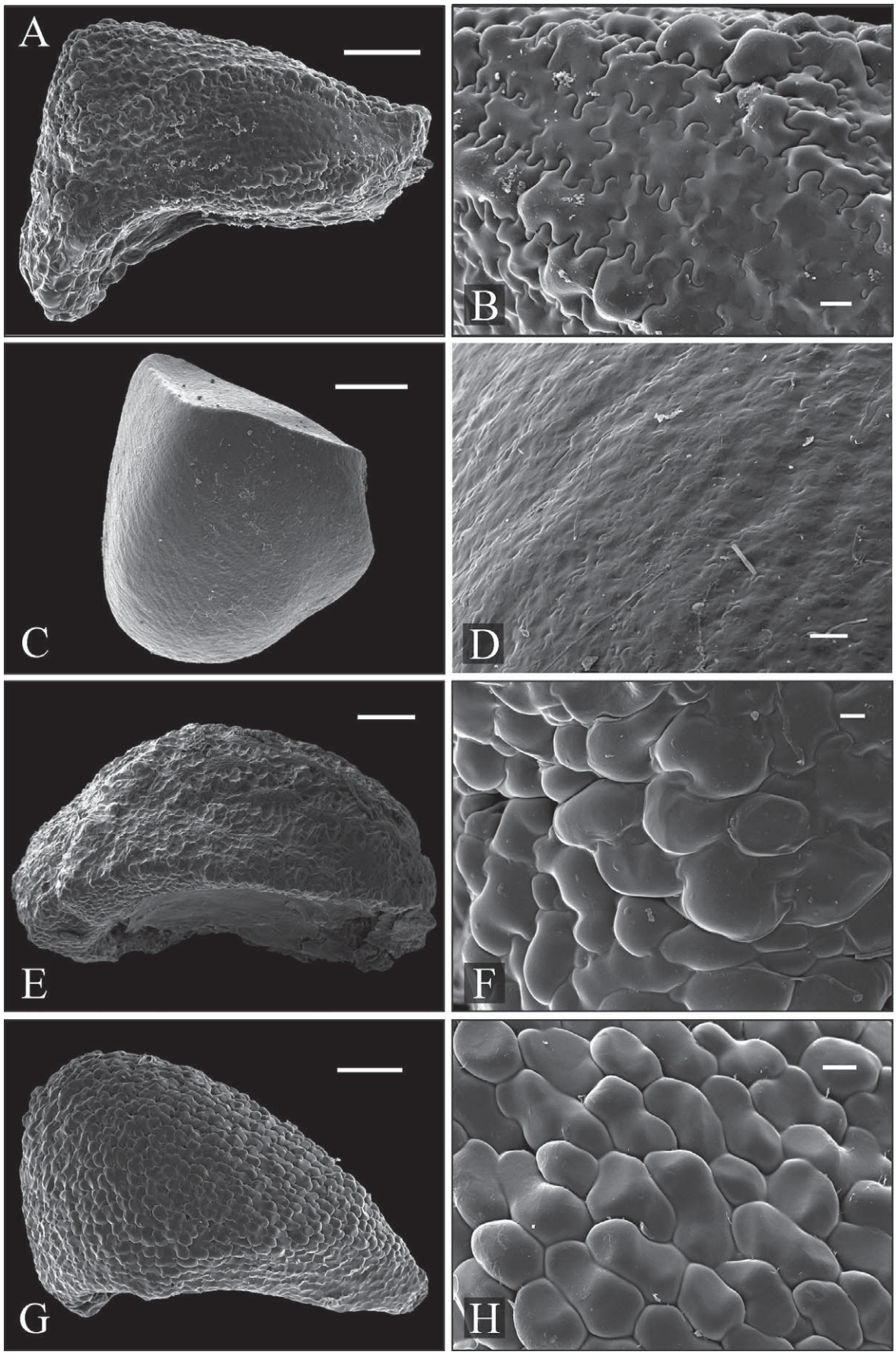

FIGURE 33. A–B, *Miconia duckei;* C–D, *M. elata;* E–F, *M. ernstii;* G–H, *M. ferruginea*. Figure C in antiraphal view. Scale bars: A = 0.08 mm; B, F, H = 0.01 mm; C = 0.3 mm; D = 0.02 mm; E = 0.2 mm; G = 0.1 mm.

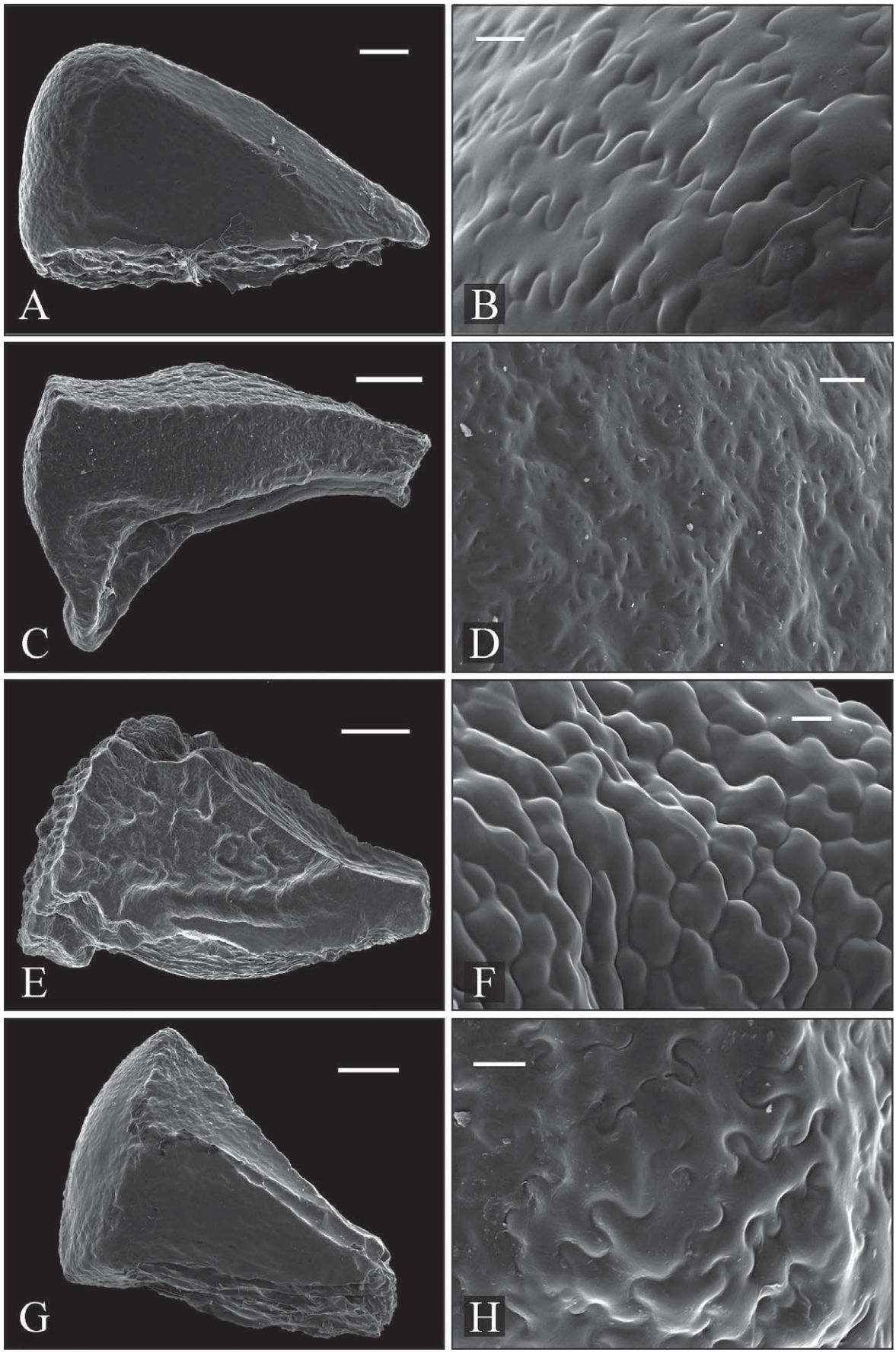

FIGURE 34. A–B, *Miconia foveolata;* C–D, *M. friedmaniorum;* E–F, *M. furfuracea;* G–H, *M. glandulifera*. Scale bars: A = 0.09; B, D, F = 0.01 mm; C = 0.08 mm; E = 0.2 mm; G = 0.1 mm; H = 0.009 mm.

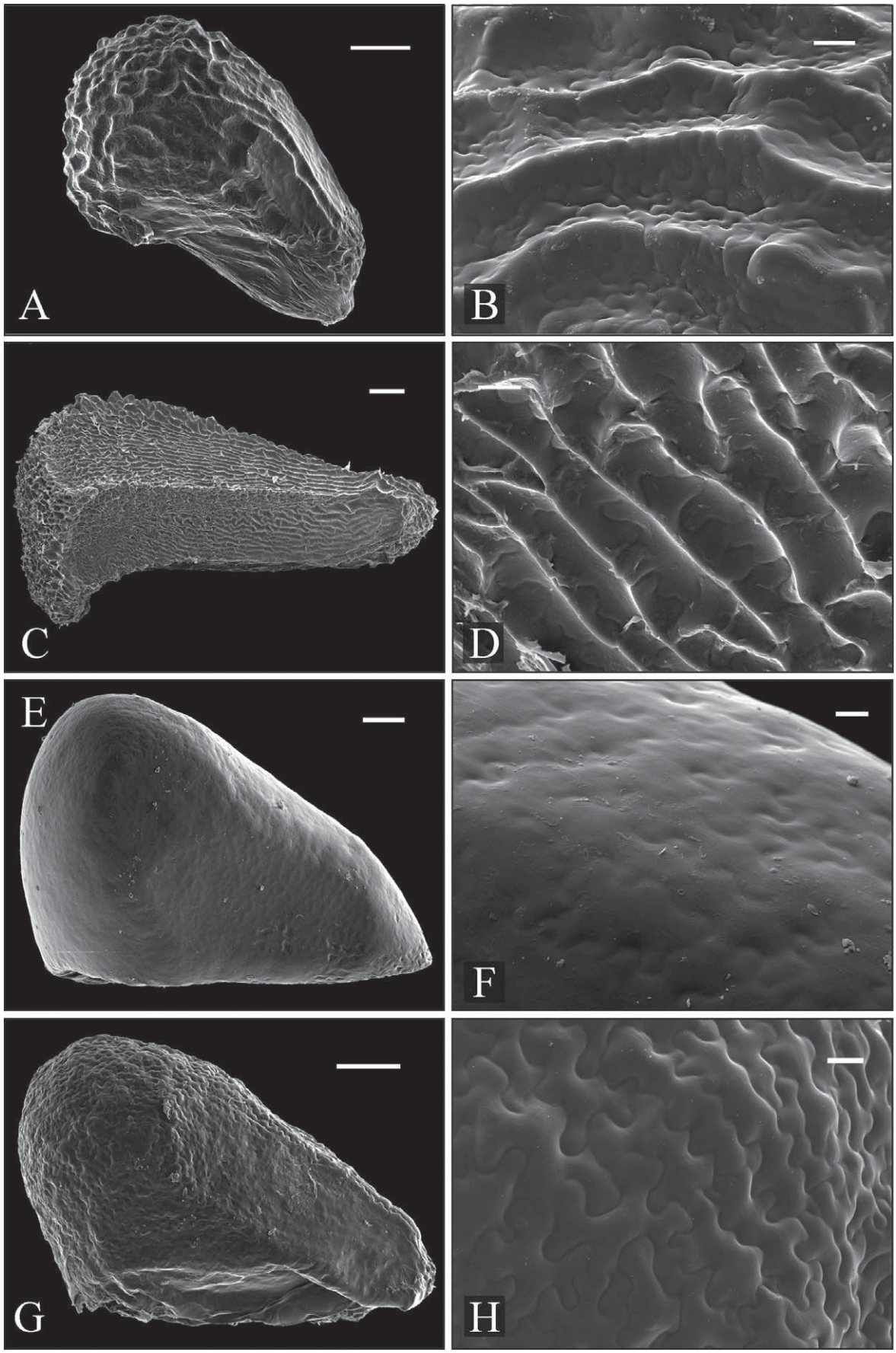

FIGURE 35. A–B, *Miconia globuliflora;* C–D, *M. gratissima;* E–F, *M. harlingii;* G–H, *M. hemenostigma*. Scale bars: A, C, E, G = 0.1 mm; B, F, H = 0.01 mm; D = 0.009 mm.

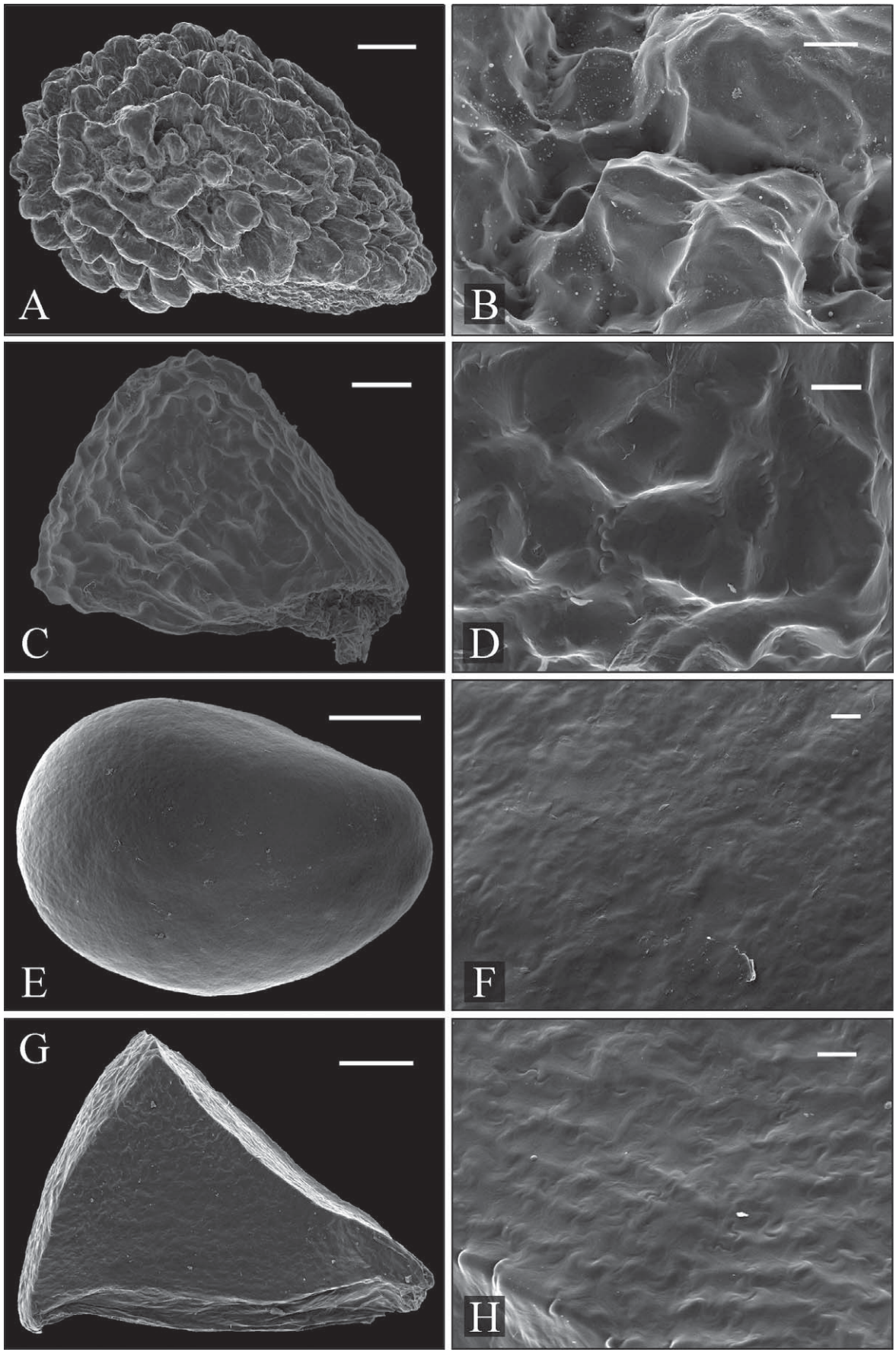

FIGURE 36. A–B, *Miconia holosericea;* C–D, *M. hookeriana;* E–F, *M. hyemalis;* G–H, *M. hypoleuca*. Scale bars: A = 0.2 mm; B, D = 0.02 mm; C, G = 0.1 mm; E = 0.5 mm; F, H = 0.01 mm.

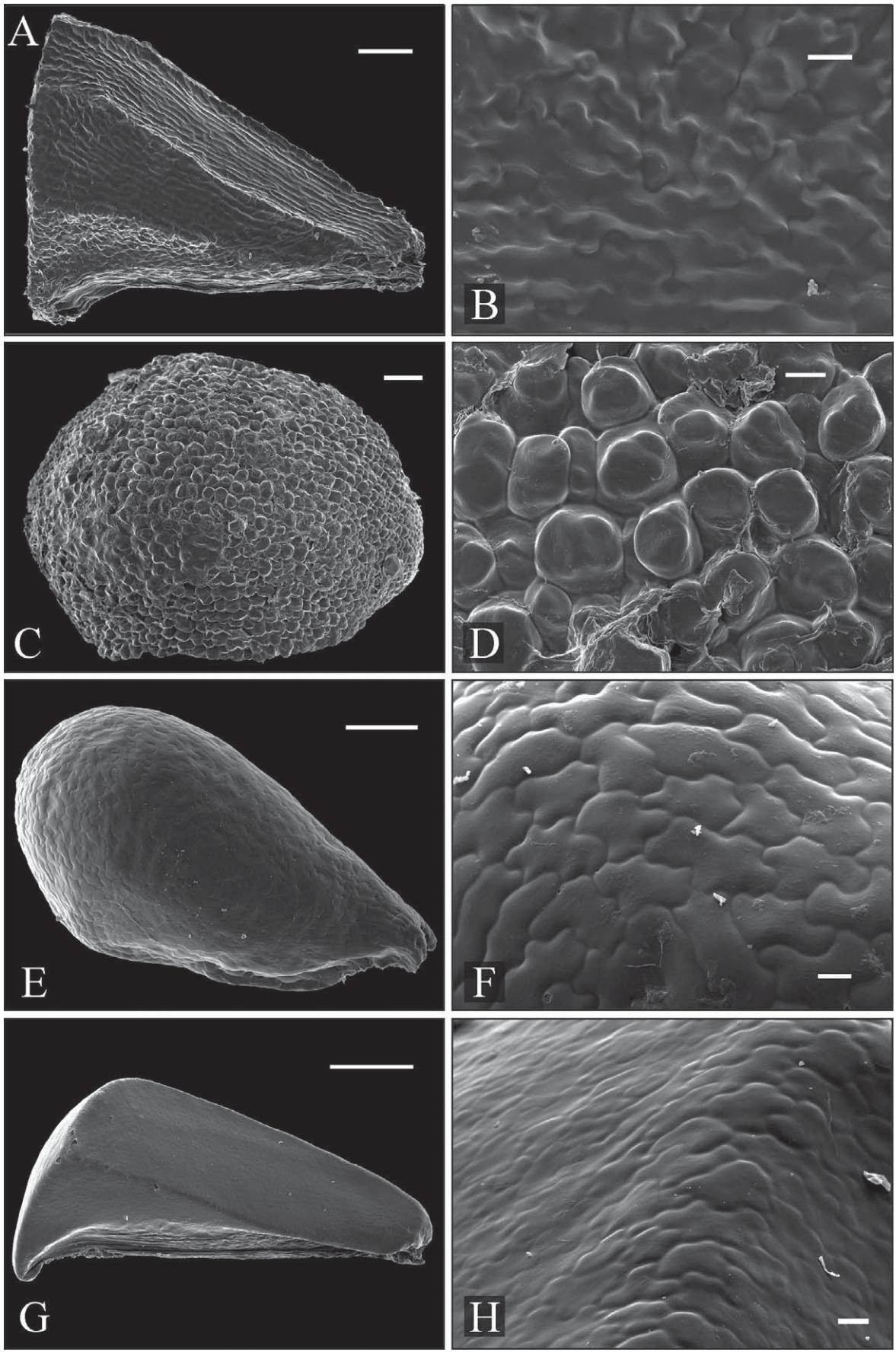

FIGURE 37. A–B, *Miconia ibaguensis;* C–D, *M. inconspicua;* E–F, *M. jahnii;* G–H, *M. jucunda*. Figure C in antiraphal view. Scale bars: A, C, E = 0.1 mm; B, F, H = 0.01 mm; D = 0.02 mm; G = 0.2 mm.

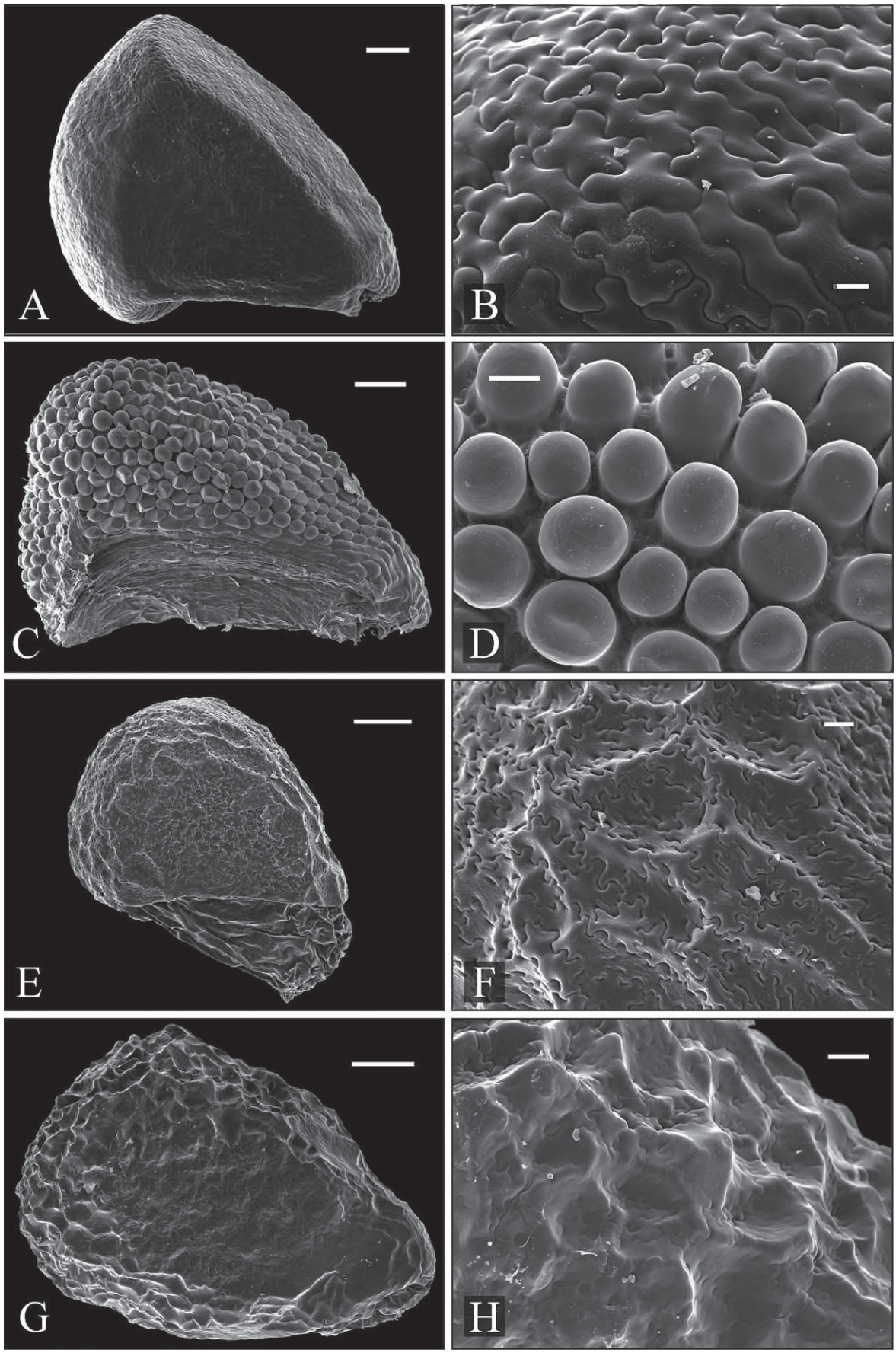

FIGURE 38. A–B, *Miconia krugii;* C–D, *M. labiakana;* E–F, *M. lacera;* G–H, *M. laevigata*. Scale bars: A, G = 0.1 mm; B, F = 0.01 mm; C = 0.2 mm; D, H = 0.02 mm; E = 0.08 mm.

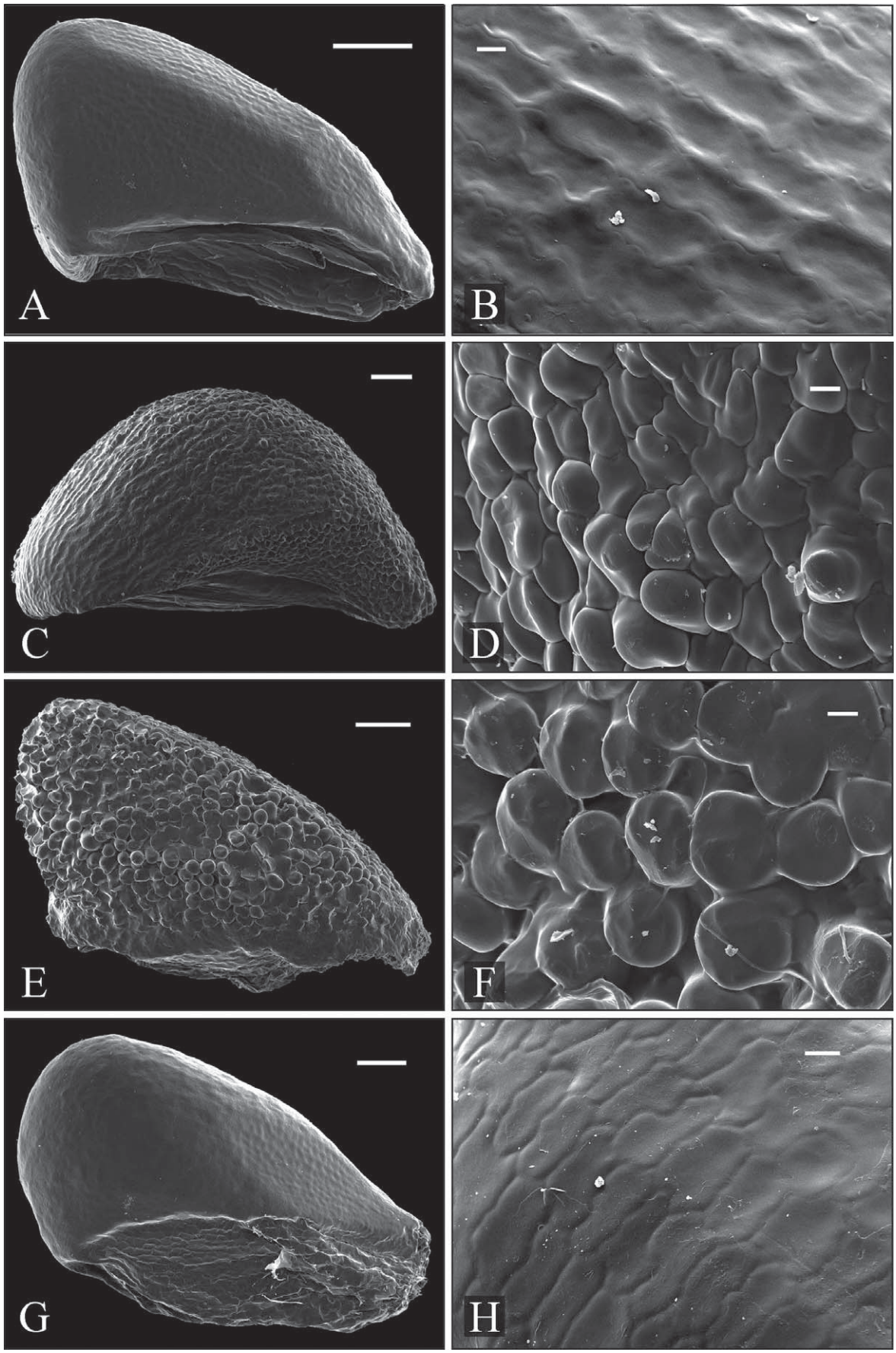

FIGURE 39. A–B, *Miconia lanceolata;* C–D, *M. latecrenata;* E–F, *M. latifolia;* G–H, *M. leiotricha*. Scale bars: A = 0.2 mm; B, D, F, H = 0.01 mm; C, E, G = 0.1 mm.

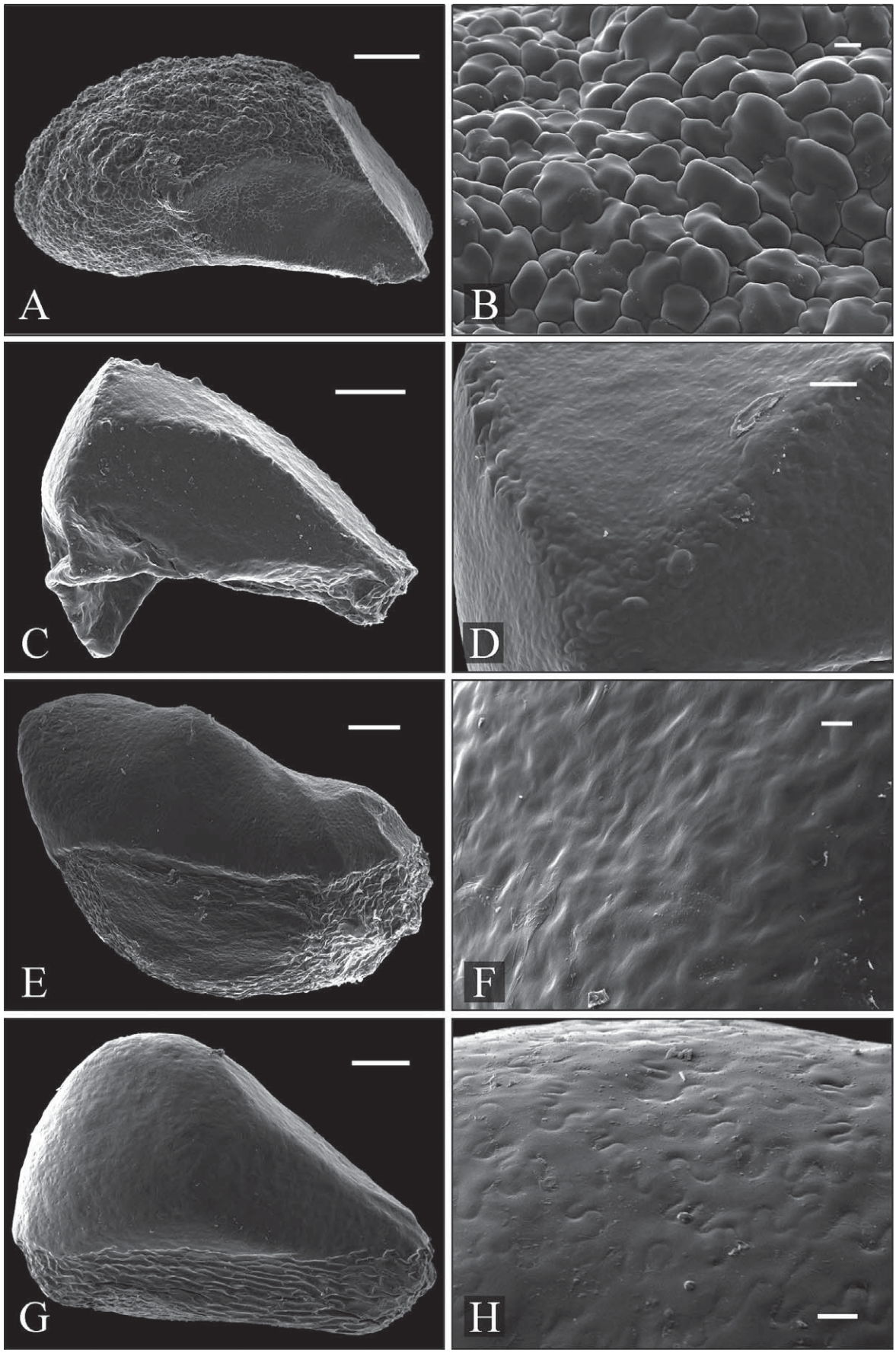

FIGURE 40. A–B, *Miconia lepidota;* C–D, *M. ligulata;* E–F, *M. ligustrina;* G–H, *M. livida*. Scale bars: A, E = 0.2 mm; B, F, H = 0.01 mm; C, G = 0.08 mm; D = 0.02 mm.

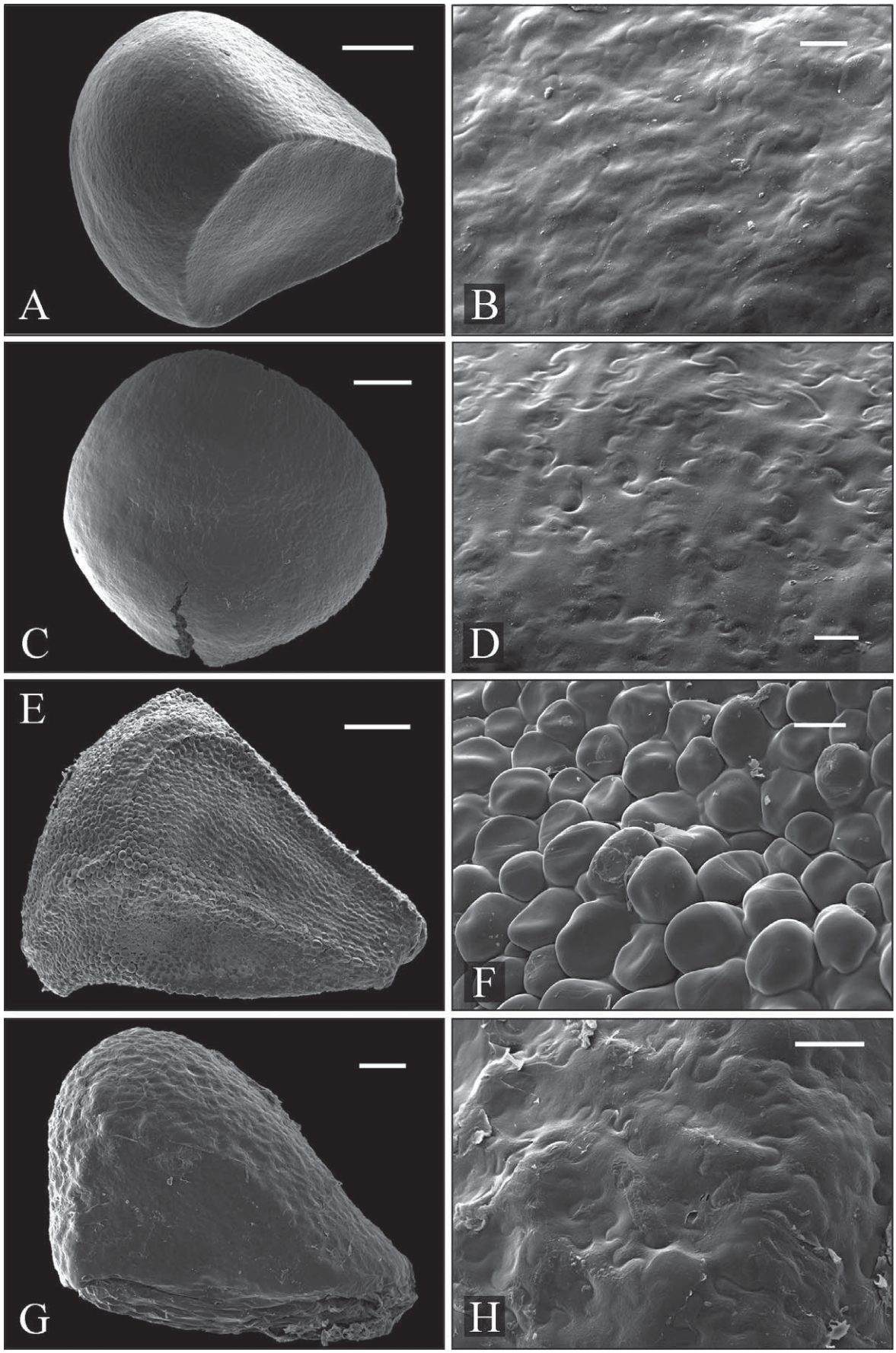

FIGURE 41. A–B, *Miconia lonchophylla;* C–D, *M. longicuspis;* E–F, *M. longispicata;* G–H, *M. loreyoides*. Figures A and C in antiraphal view. Scale bars: A = 0.3 mm; B, D, F, H = 0.02 mm; C = 0.5 mm; E = 0.2 mm; G = 0.09 mm.

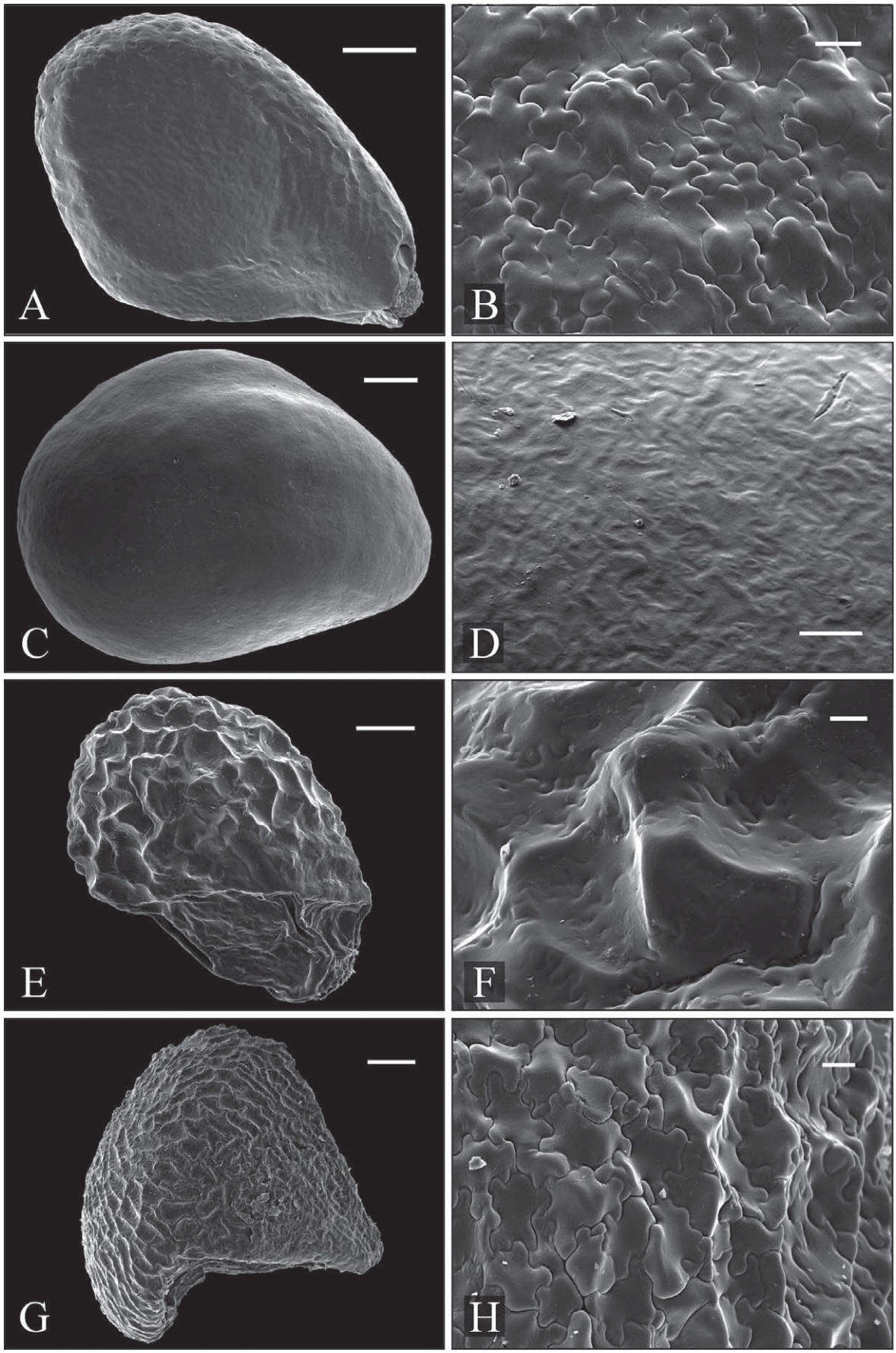

FIGURE 42. A–B, *Miconia luteola;* C–D, *M. lymanii;* E–F, *M. macrodon;* G–H, *M. magdalenae*. Figure C in antiraphal view. Scale bars: A = 0.2 mm; B, D = 0.02 mm; C = 0.3 mm; E = 0.08 mm; F, H = 0.01 mm; G = 0.1 mm.

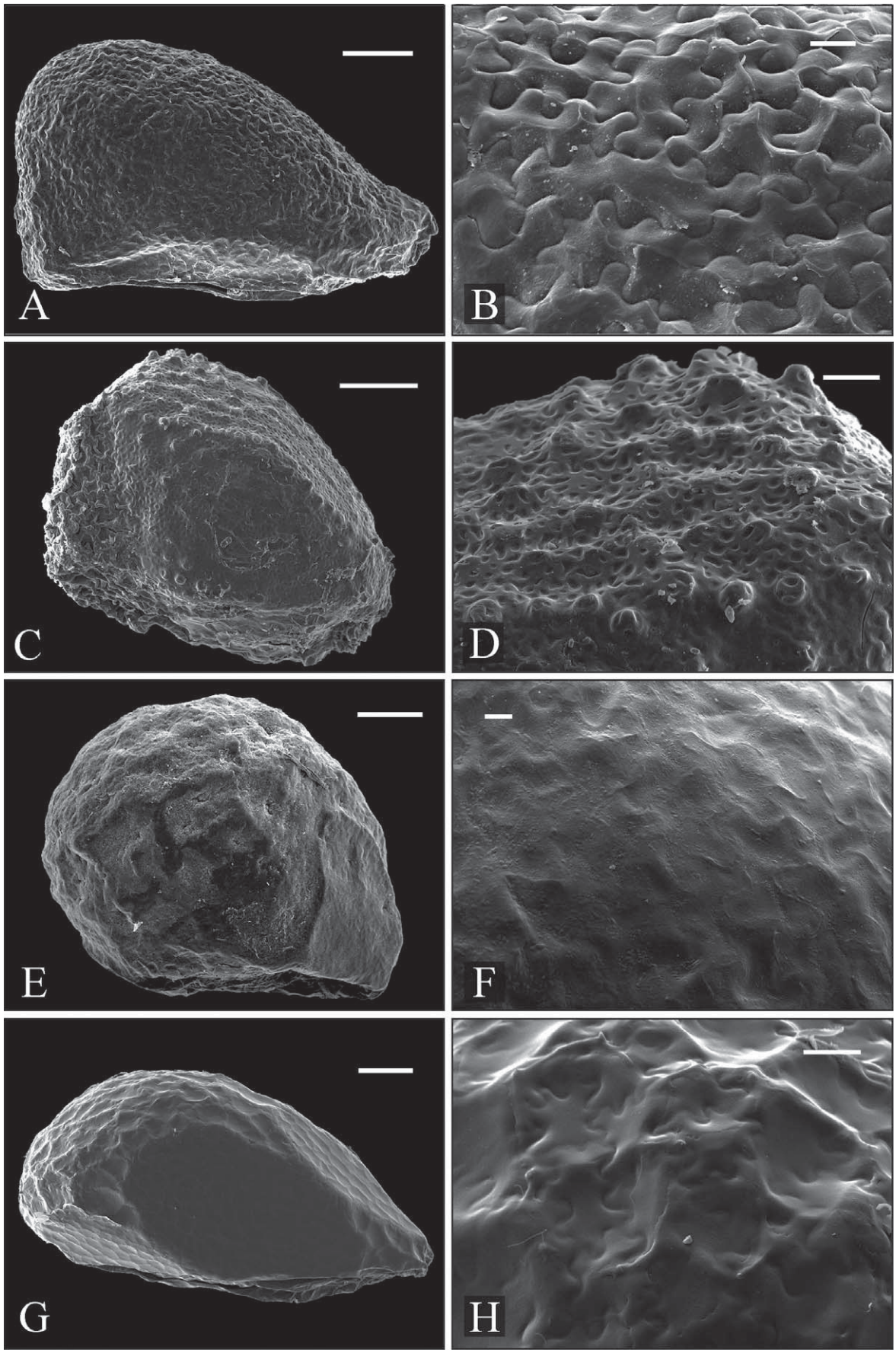

FIGURE 43. A–B, *Miconia manicata;* C–D, *M. marginata;* E–F, *M. melanotricha;* G–H, *M. meridensis*. Scale bars: A, E = 0.1 mm; B, F = 0.01 mm; C, G = 0.08 mm; D = 0.02 mm; H = 0.012 mm.

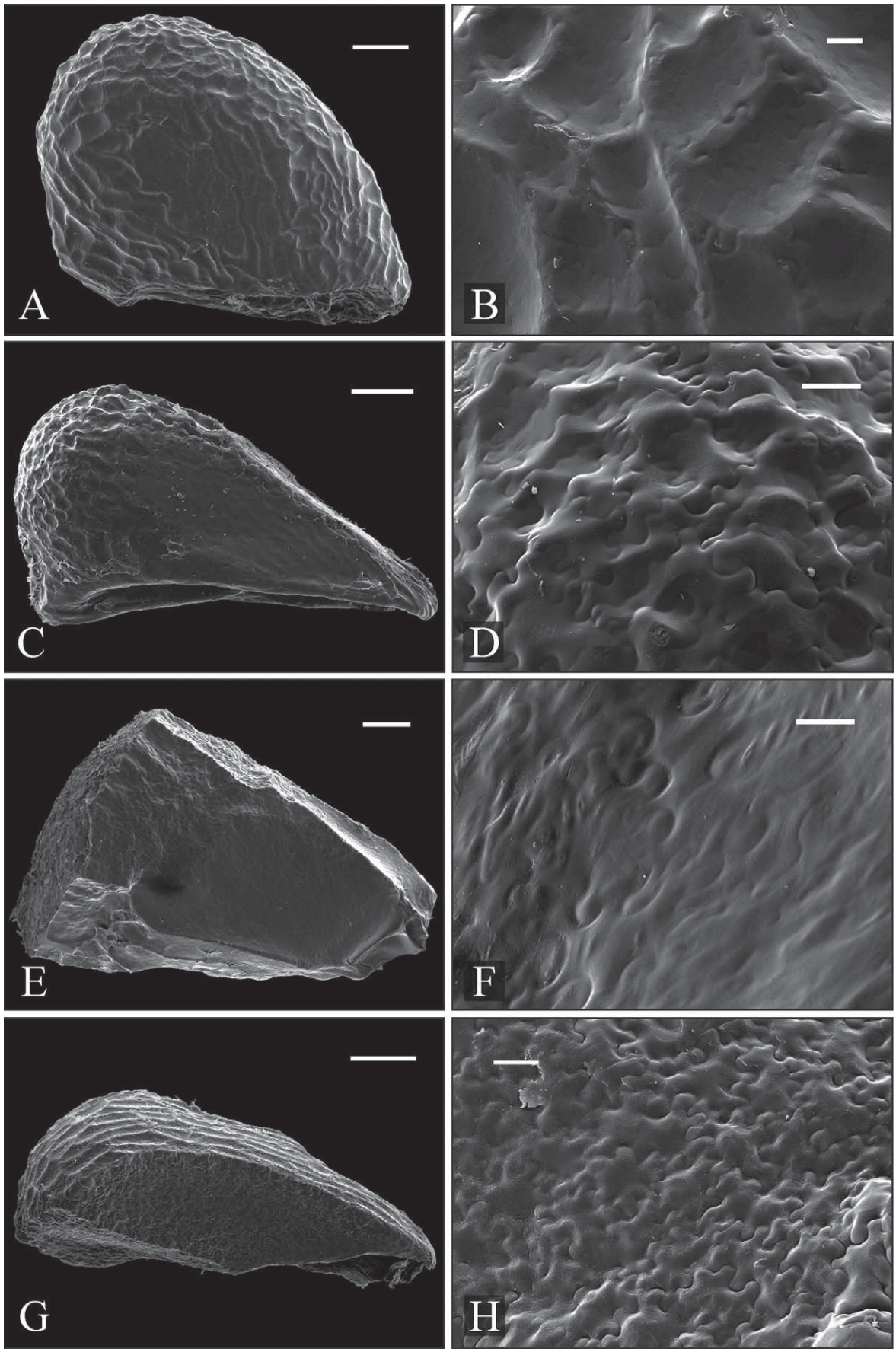

FIGURE 44. A–B, *Miconia molybdea;* C–D, *M. multiplinervia;* E–F, *M. multispicata;* G–H, *M. nervosa*. Scale bars: A = 0.08 mm; B, H = 0.01 mm; C, G = 0.1 mm; D = 0.02 mm; E = 0.2 mm; F = 0.012 mm.

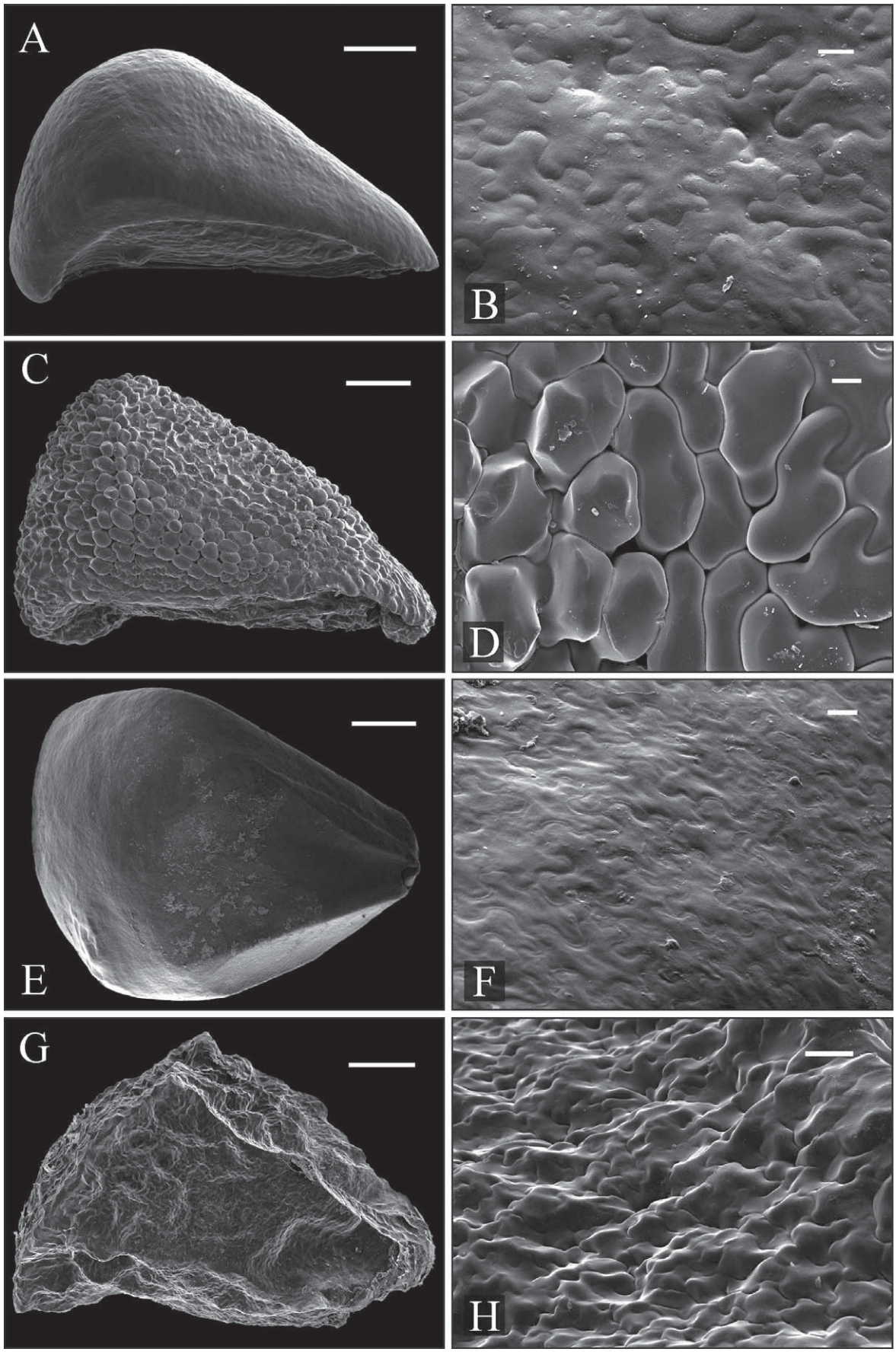

FIGURE 45. A–B, *Miconia nitidissima;* C–D, *M. nystroemii;* E–F, *M. octopetala;* G–H, *M. oldemanii*. Figure E in antiraphal view. Scale bars: A = 0.2 mm; B, D, F = 0.01 mm; C = 0.12 m; E = 0.5 mm; G = 0.15 mm; H = 0.02 mm.

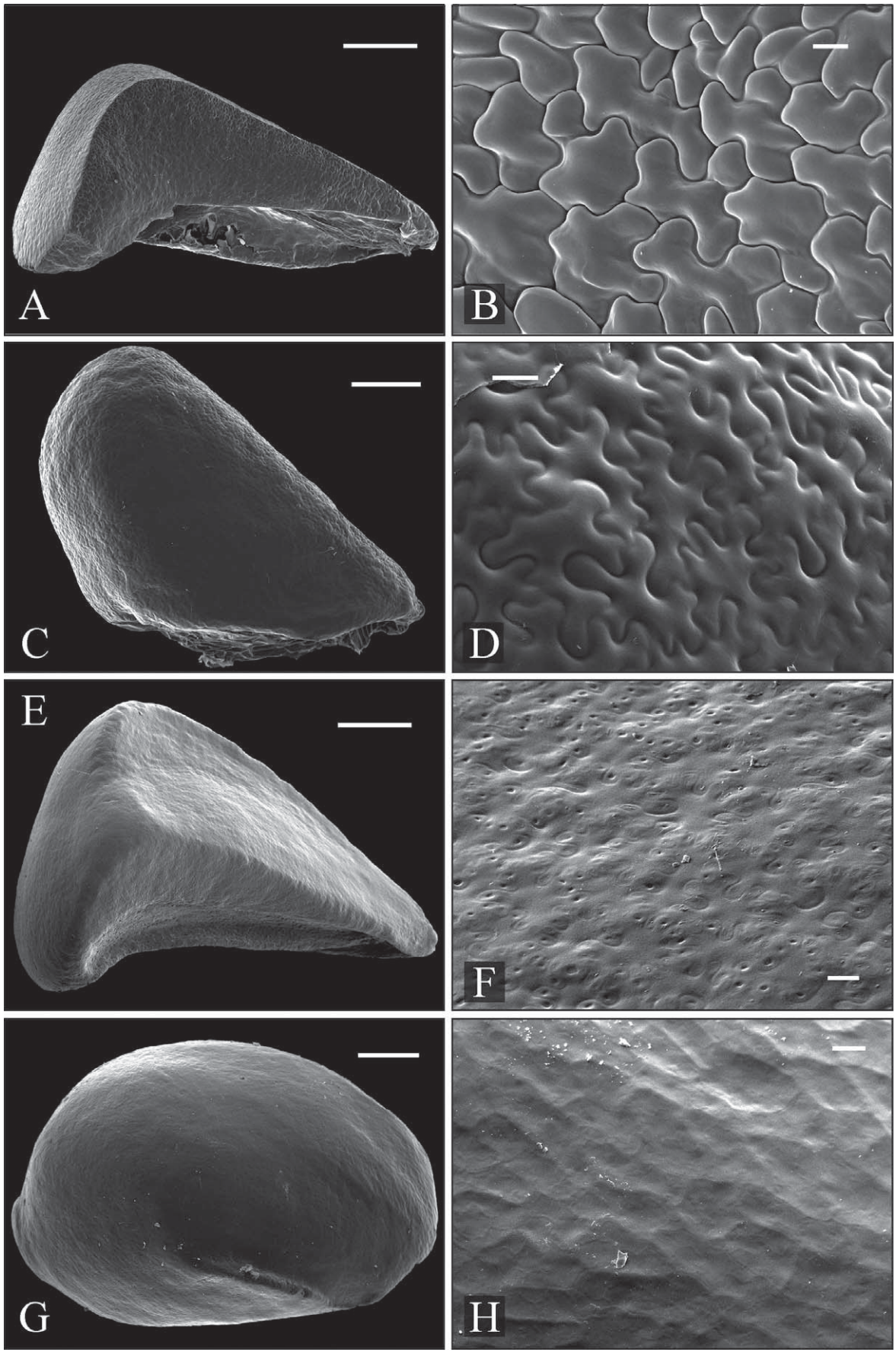

FIGURE 46. A–B, *Miconia pachyphylla;* C–D, *M. papillosa;* E–F, *M. paradoxa;* G–H, *M. phanerostila*. Figure G in antiraphal view. Scale bars: A, E, G = 0.3 mm; B, F = 0.01 mm; C = 0.1 mm; D = 0.009 mm; H = 0.02 mm.

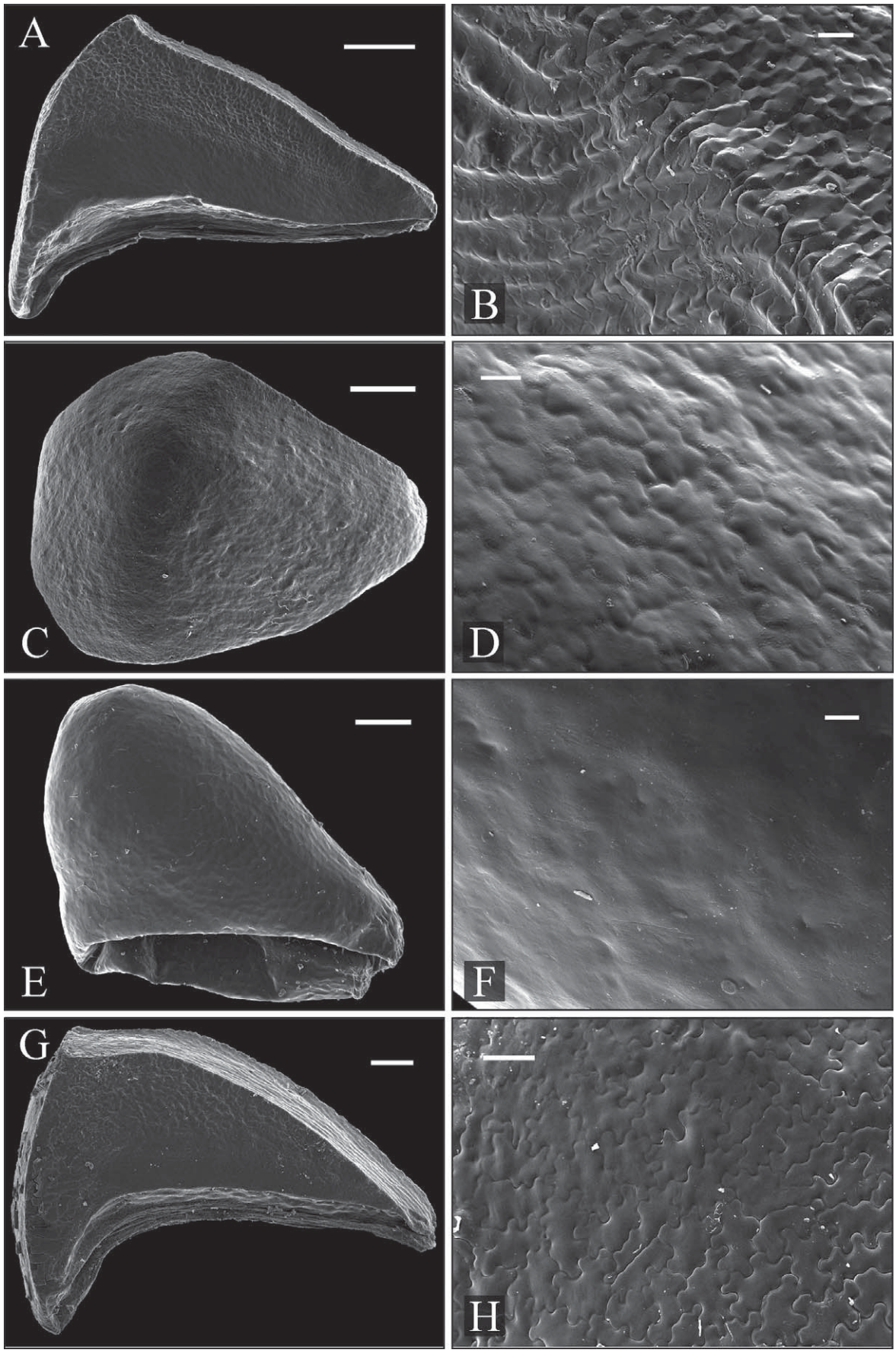

FIGURE 47. A–B, *Miconia poeppigii;* C–D, *M. polyandra;* E–F, *M. polygama;* G–H, *M. prasina*. Figure C in antiraphal view. Scale bars: A, C = 0.2 mm; B, H = 0.02 mm; D, F = 0.01 mm; E, G = 0.1 mm.

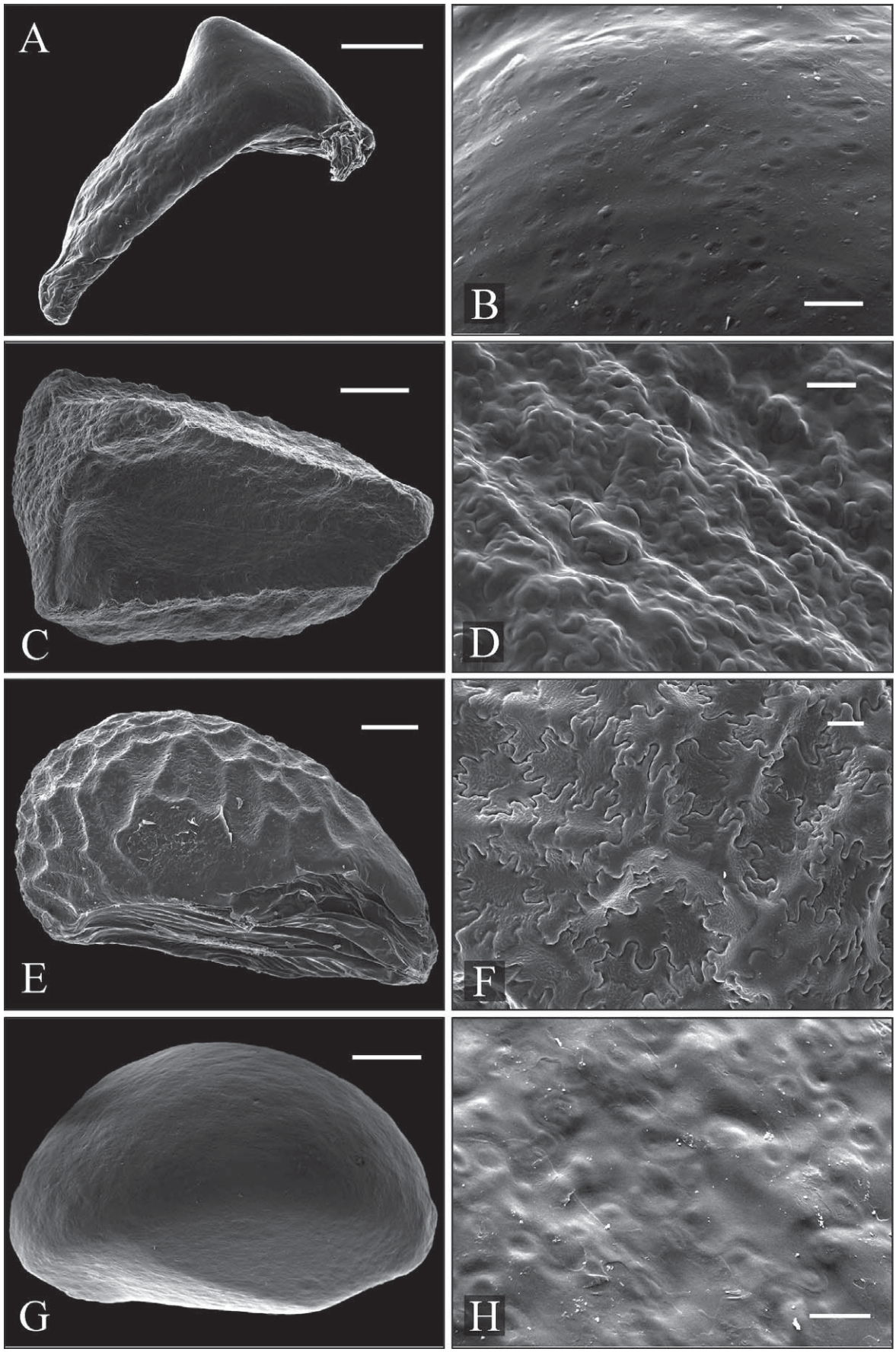

FIGURE 48. A–B, *Miconia procumbens;* C–D, *M. pubipetala;* E–F, *M. pulvinata;* G–H, *M. punctata*. Figures C and G in antiraphal view. Scale bars: A = 0.1 mm; B = 0.008 mm; C = 0.2 mm; D, F = 0.01 mm; E = 0.08 mm; G = 0.4 mm; H = 0.009 mm.

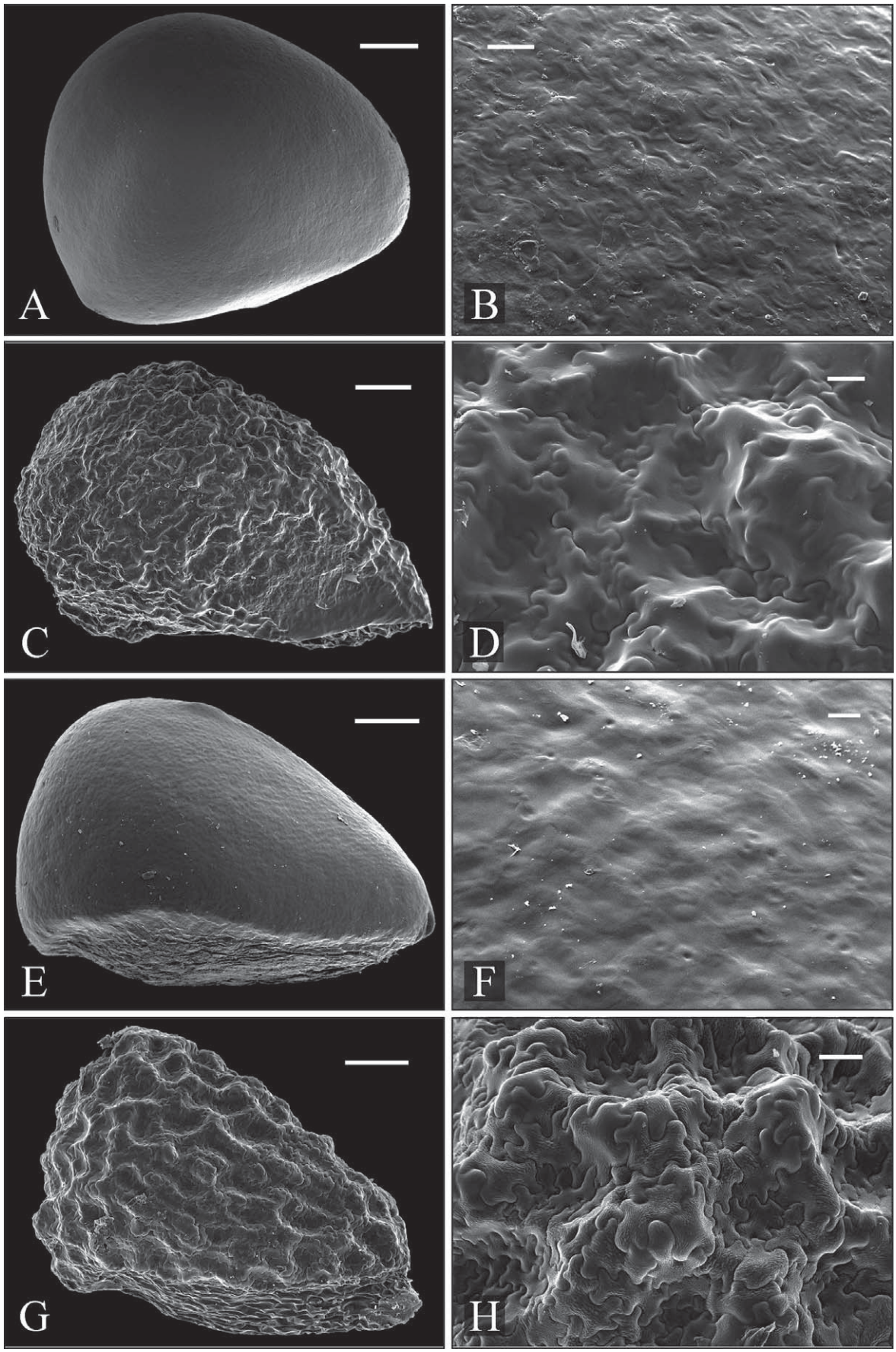

FIGURE 49. A–B, *Miconia pusilliflora;* C–D, *M. pyramidalis;* E–F, *M. ramboi;* G–H, *M. reducens*. Figure A in antiraphal view. Scale bars: A = 0.3 mm; B, H = 0.02 mm; C, G = 0.1 mm; D, F = 0.01 mm; E = 0.2 mm.

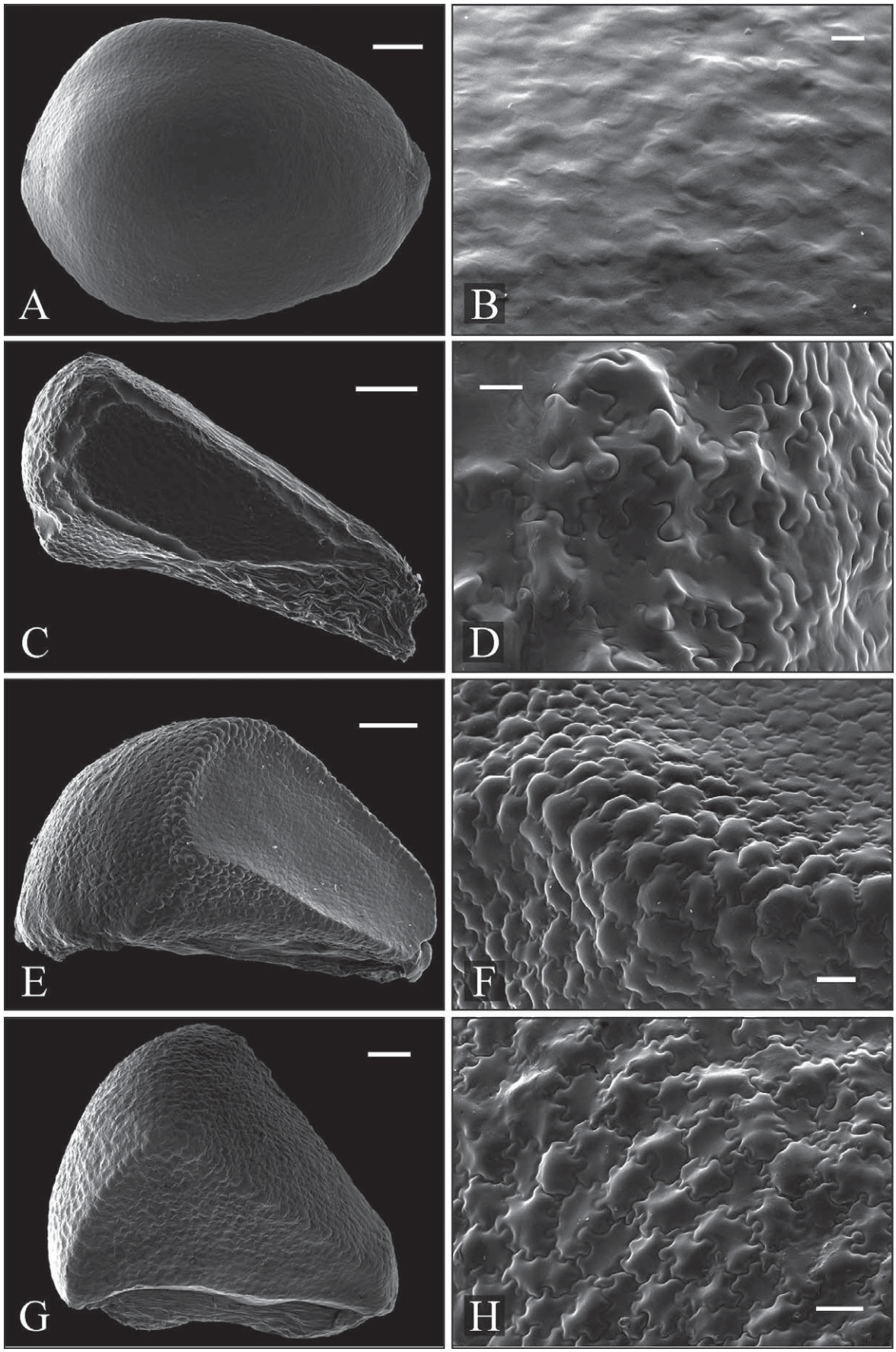

FIGURE 50. A–B, *Miconia rimalis;* C–D, *M. rosea;* E–F, *M. rubiginosa;* G–H, *M. rufescens*. Figure A in antiraphal view. Scale bars: A, E = 0.2 mm; B = 0.01 mm; C = 0.08 mm; D = 0.009 mm; F = 0.03 mm; G = 0.1 mm; H = 0.02 mm.

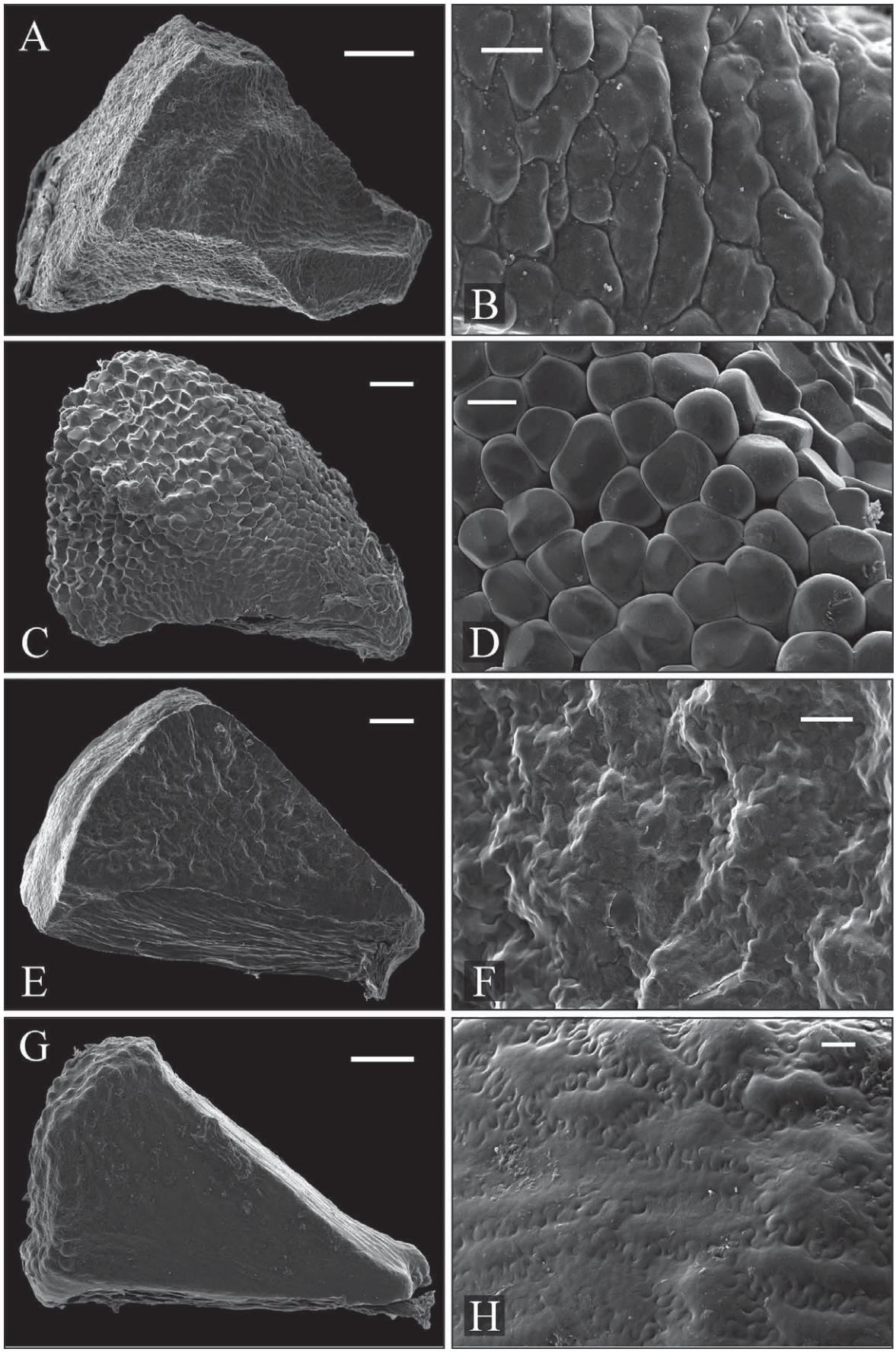

FIGURE 51. A–B, *Miconia rugosa;* C–D, *M. samanensis;* E–F, *M. sanctiphilippi;* G–H, *M. schlimii*. Scale bars: A = 0.2 mm; B, D, F = 0.02 mm; C = 0.09 mm; E, G = 0.1 mm; H = 0.01 mm.

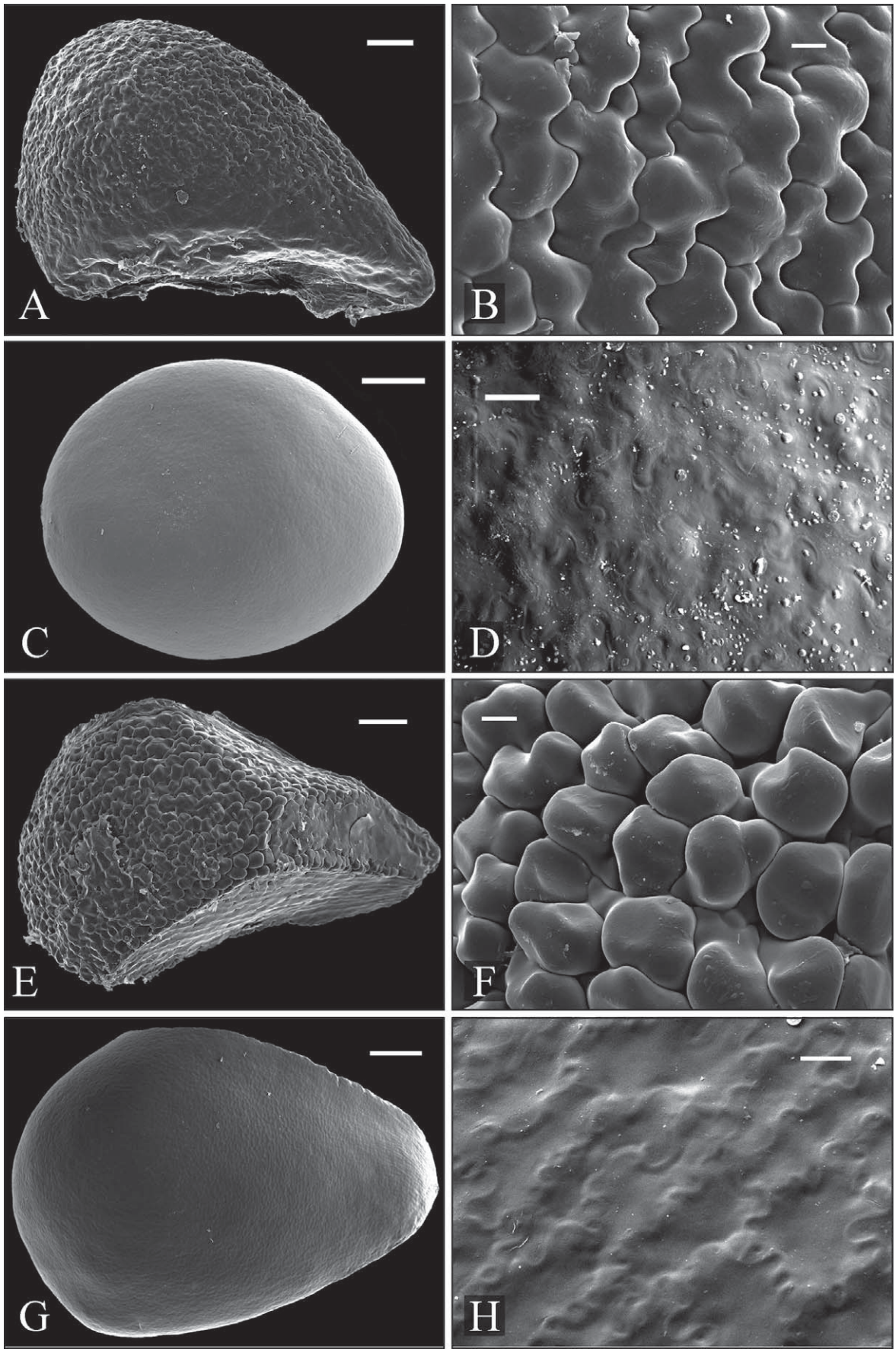

FIGURE 52. A–B, *Miconia schnellii;* C–D, *M. sclerophylla;* E–F, *M. selleana;* G–H, *M. sellowiana*. Figures C, E, and G in antiraphal view. Scale bars: A, E = 0.1 mm; B, F, H = 0.01 mm; C = 0.3 mm; D = 0.02 mm; G = 0.2 mm.

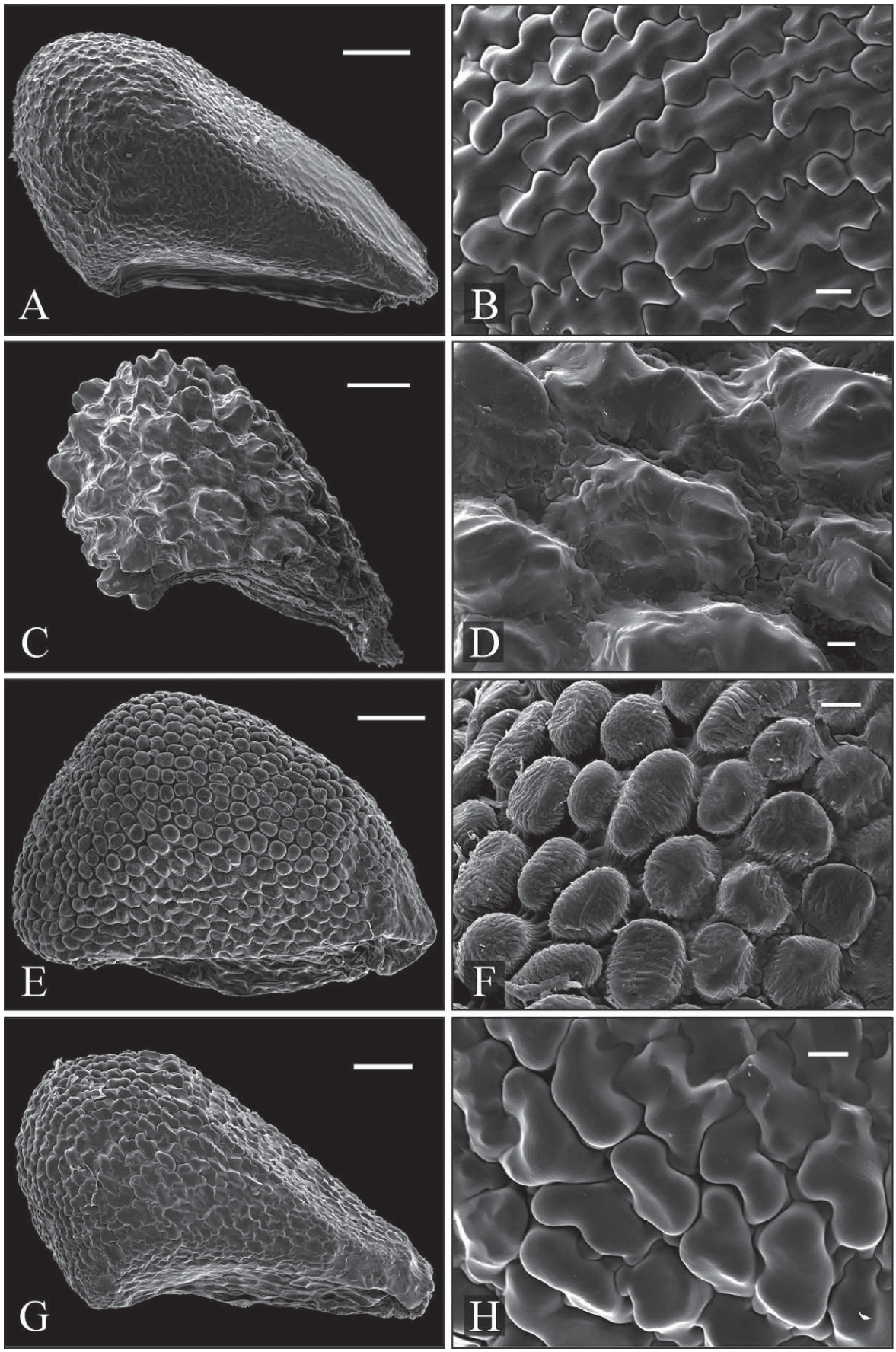

FIGURE 53. A–B, *Miconia septentrionalis;* C–D, *M. serrulata;* E–F, *M. sessilifolia;* G–H, *M. sintenisii*. A, E, G = 0.08 mm; B, D, F, H = 0.01 mm; C = 0.1 mm.

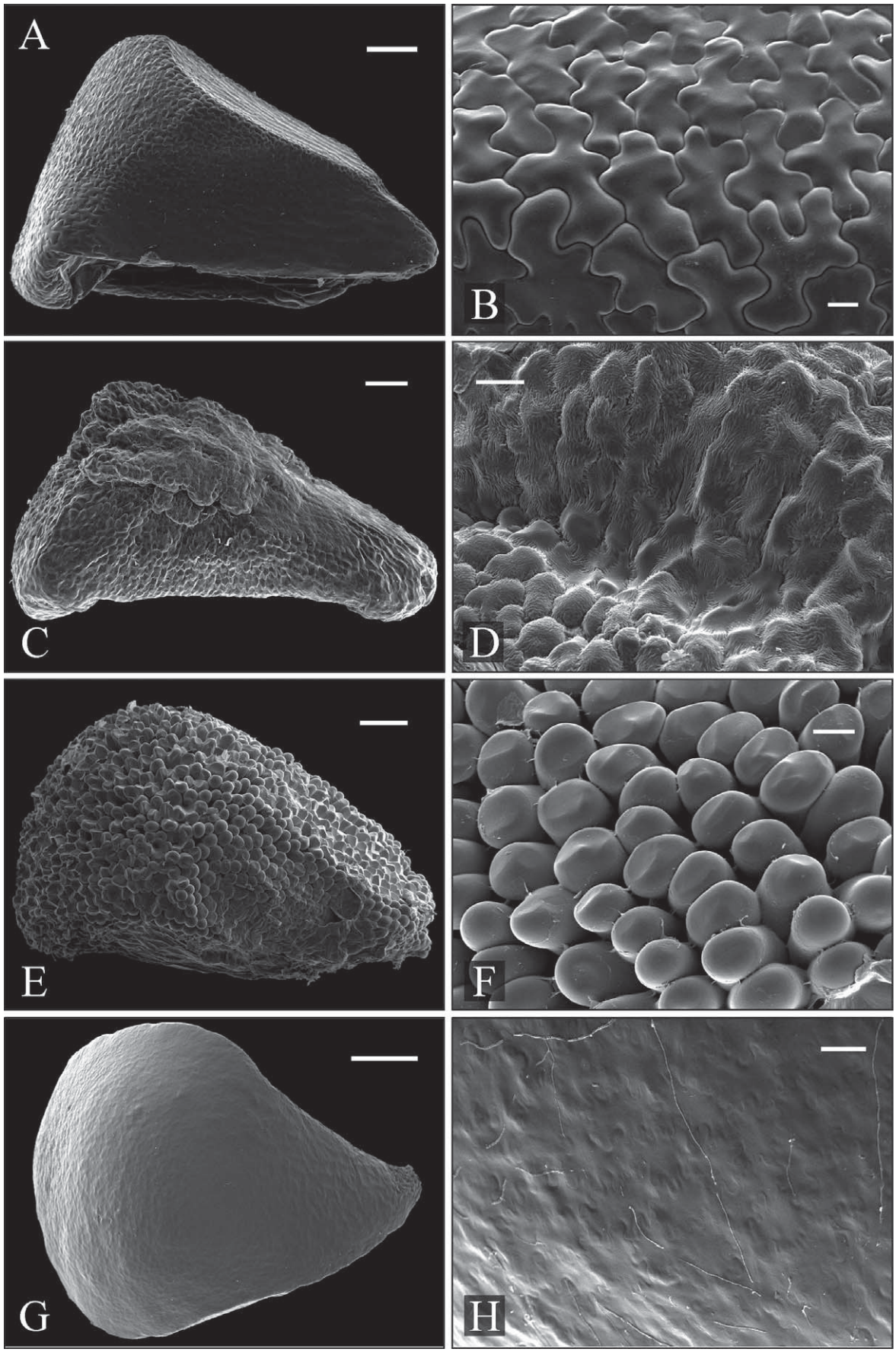

FIGURE 54. A–B, *Miconia skeaniana;* C–D, *M. smaragdina;* E–F, *M. sphagnicola;* G–H, *M. splendens*. Figure G in antiraphal view. Scale bars: A, E = 0.1 mm; B = 0.01 mm; C = 0.09 mm; D, F, H = 0.02 mm; G = 0.2 mm.

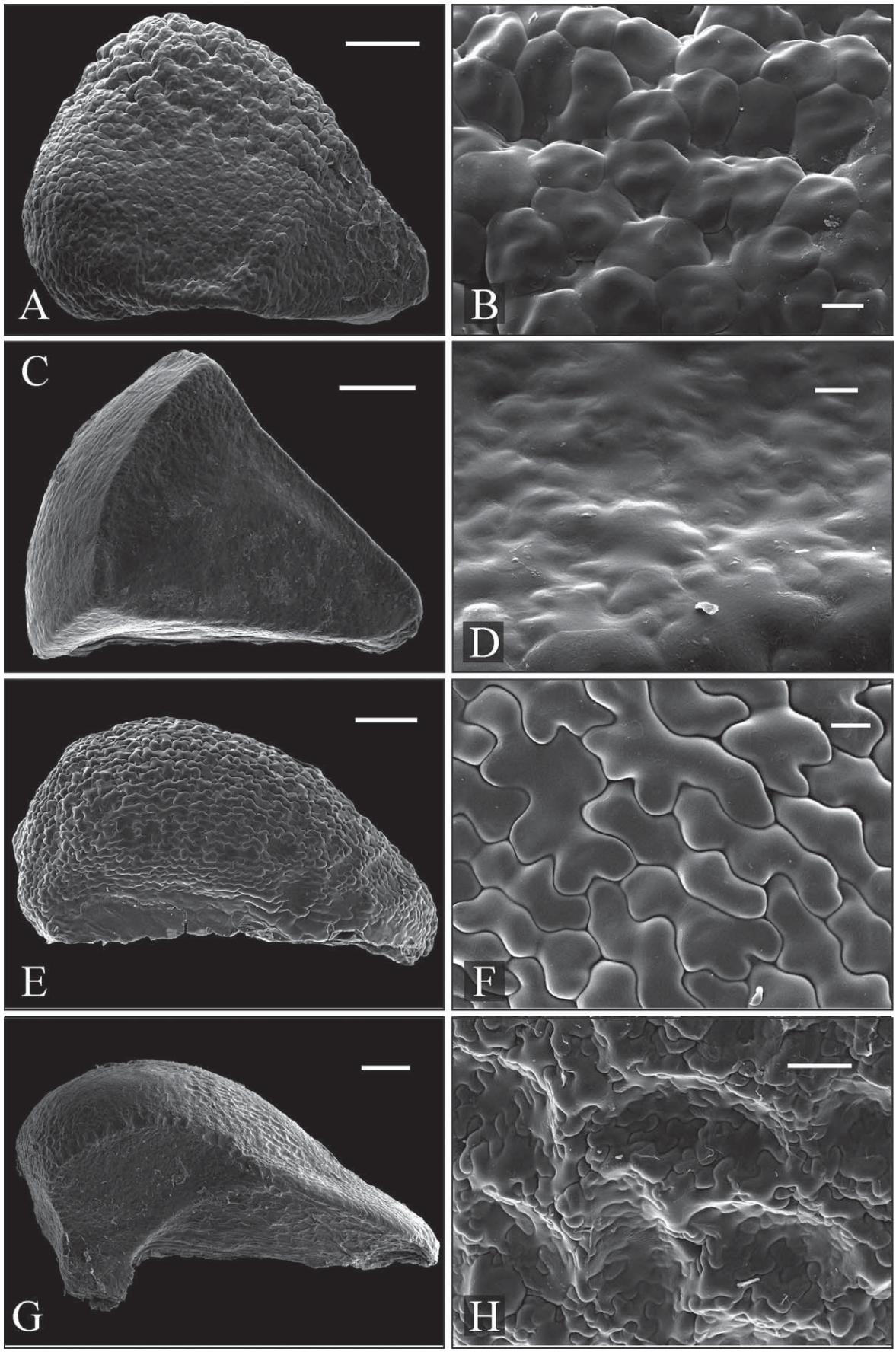

FIGURE 55. A–B, *Miconia stenobotrys;* C–D, *M. stenostachya;* E–F, *M. subcompressa;* G–H, *M. superba*. Scale bars: A, C, G = 0.2 mm; B, H = 0.02 mm; D = 0.009 mm; E = 0.08 mm; F = 0.01 mm.

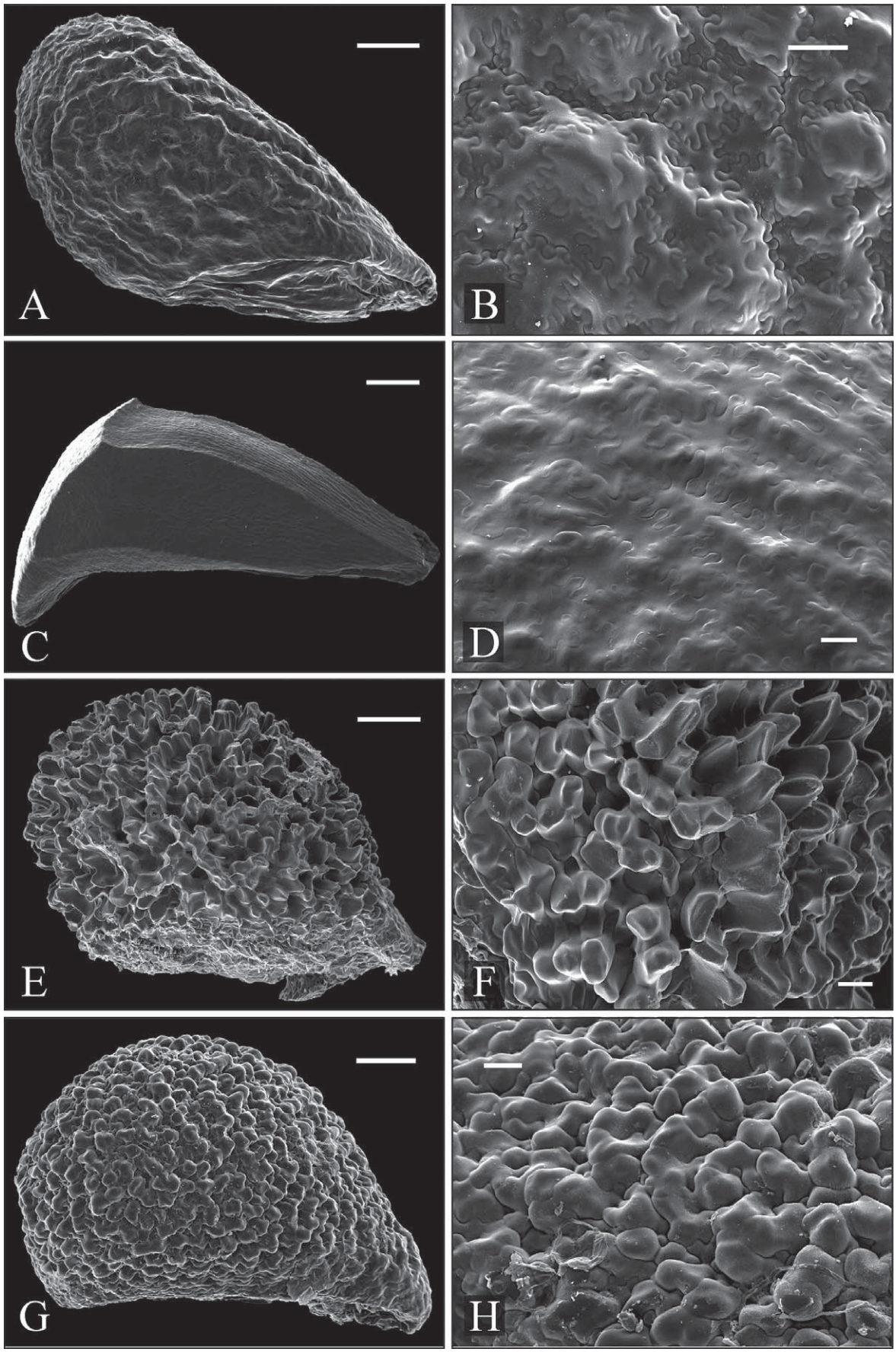

FIGURE 56. A–B, *Miconia sylvatica;* C–D, *M. tetrandra;* E–F, *M. tetrastoma;* G–H, *M. theizans* . Scale bars: A = 0.1 mm; B, D, F, H = 0.02 mm; C = 0.2 mm; E, G = 0.08 mm.

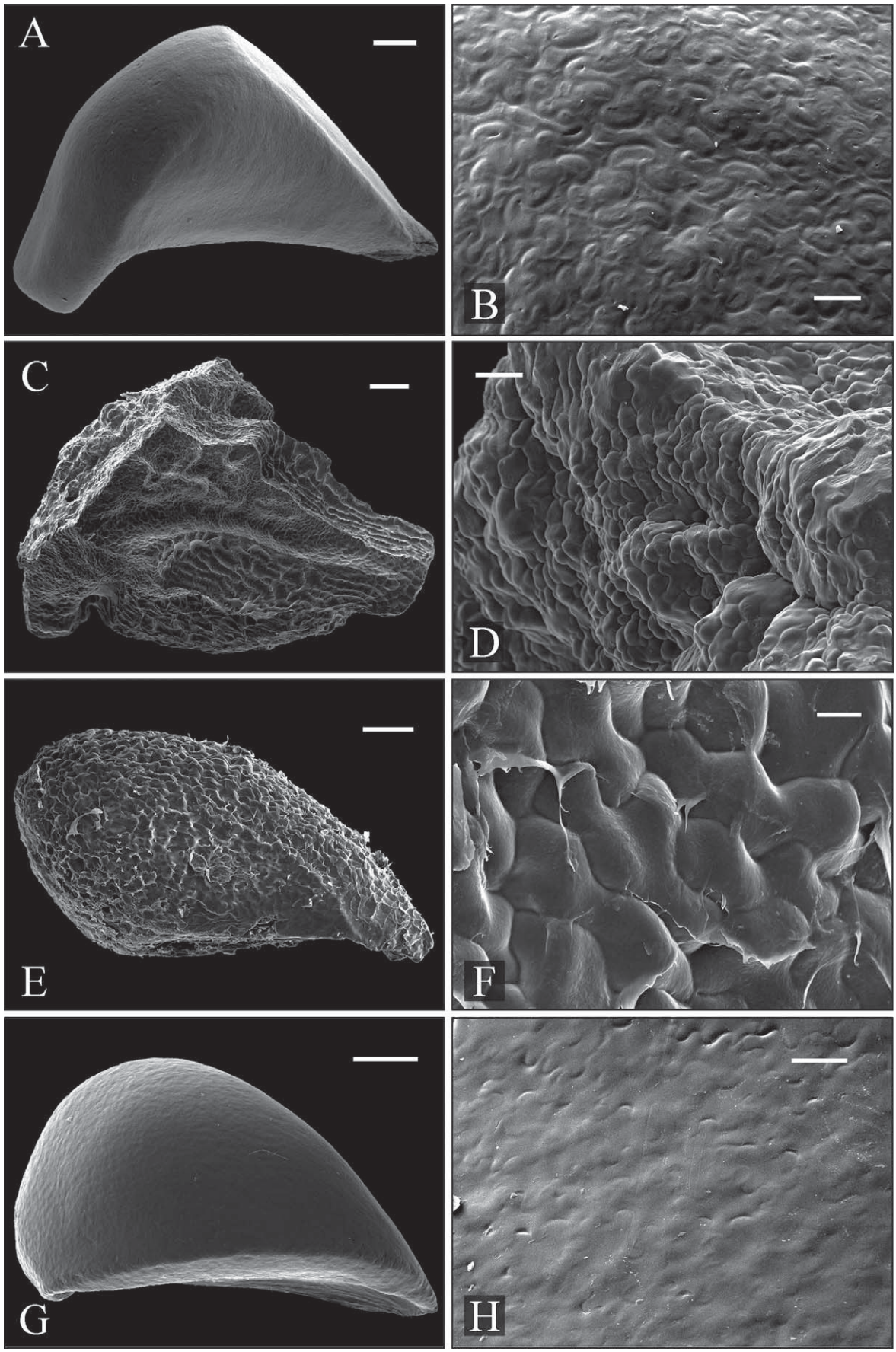

FIGURE 57. A–B, *Miconia thomasiana;* C–D, *M. tomentosa;* E–F, *M. tonduzii;* G–H, *M. trianae*. Scale bars: A, G = 0.2 mm; B, D, F, H = 0.02 mm; C, E = 0.1 mm.

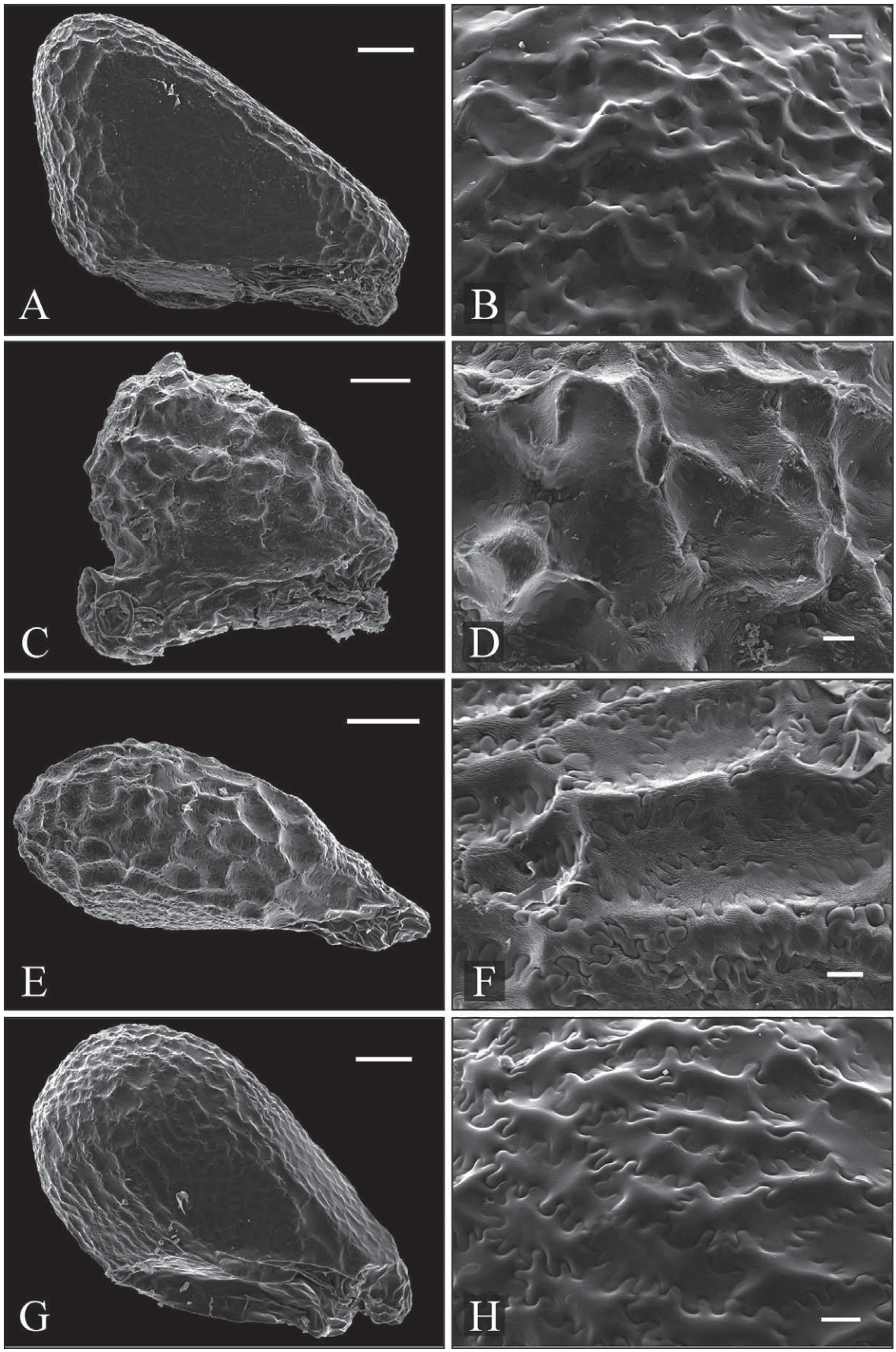

FIGURE 58. A–B, *Miconia triangularis;* C–D, *M. trimera;* E–F, *M. triplinervis;* G–H, *M. tuberculata.* Scale bars: A, E = 0.08 mm; B, D, F, H = 0.01 mm; C, G = 0.06 mm.

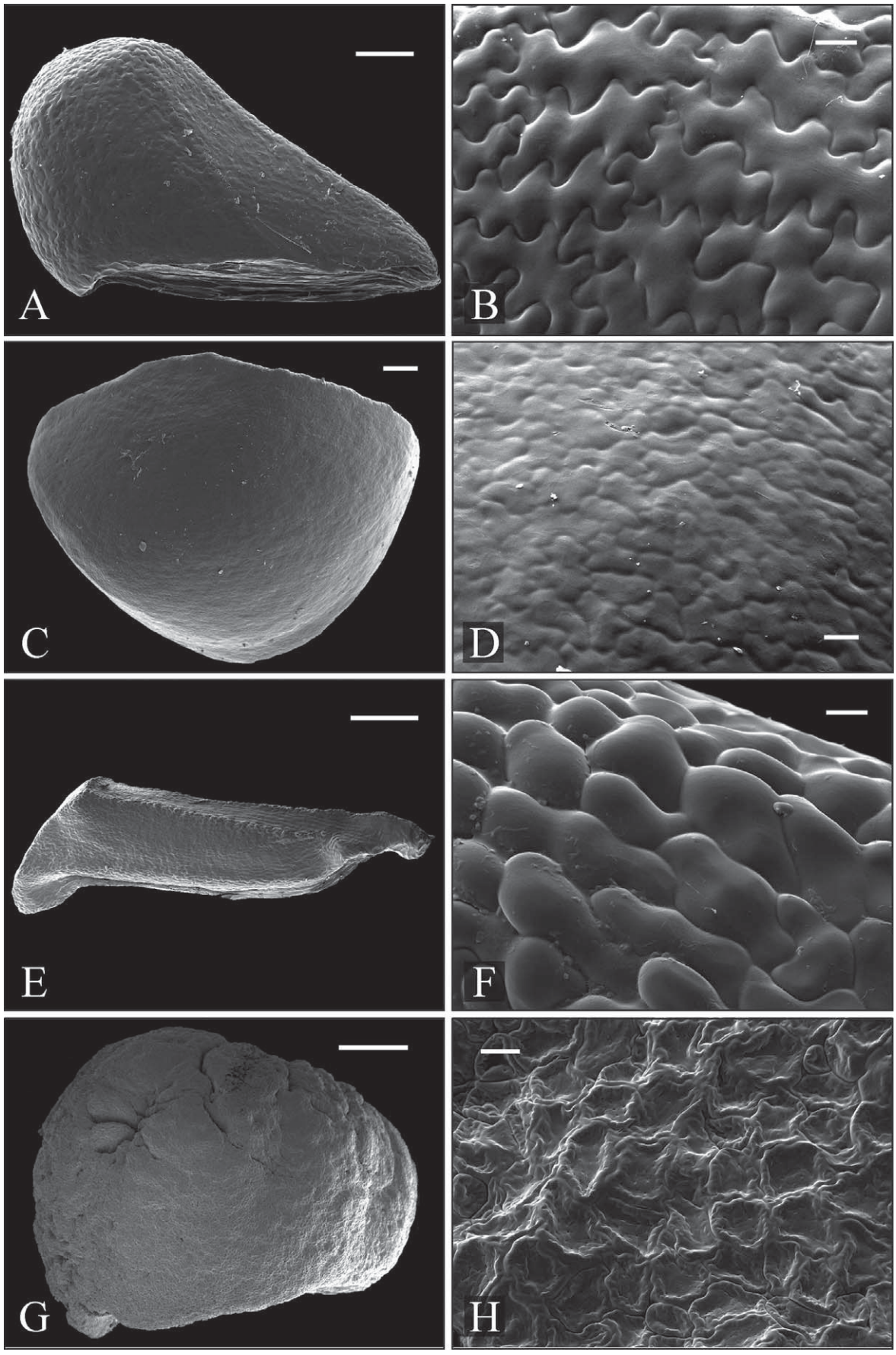

FIGURE 59. A–B, *Miconia undata;* C–D, *M. valtheri;* E–F, *M. viscidula;* G–H, *M. willdenowii*. Figures C and G in antiraphal view. Scale bars: A, C = 0.1 mm; B, D = 0.01 mm; E = 0.2 mm; F = 0.009 mm; G = 0.6 mm; H = 0.02 mm.

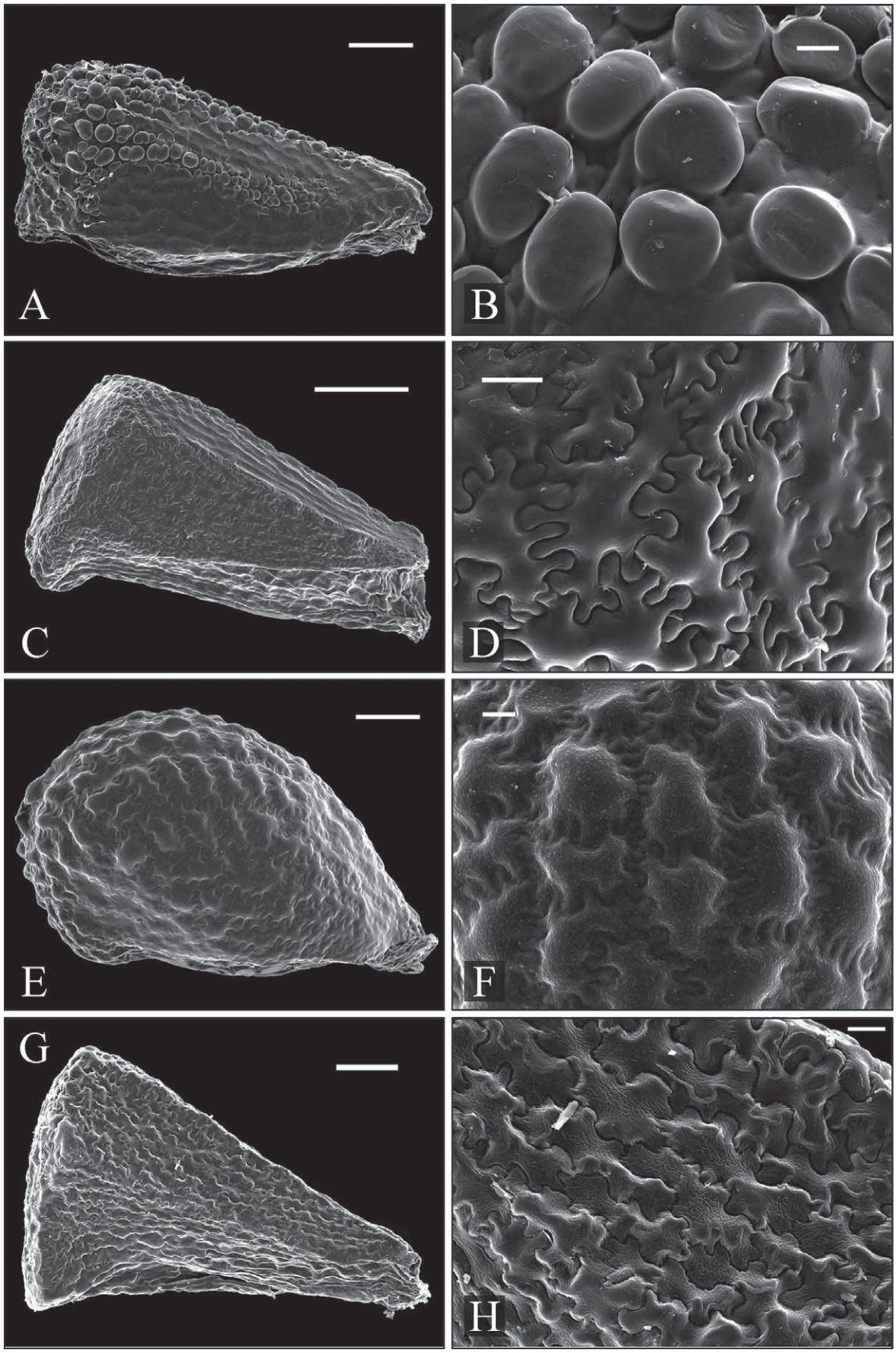

FIGURE 60. A–B, *Necramium gigantophyllum;* C–D, *Ossaea brenesii;* E–F, *O. capillaris;* G–H, *O. macrophylla*. Scale bars: A = 0.08 mm; B, D, F, H = 0.01 mm; C = 0.1 mm; E = 0.05 mm; G = 0.06 mm.

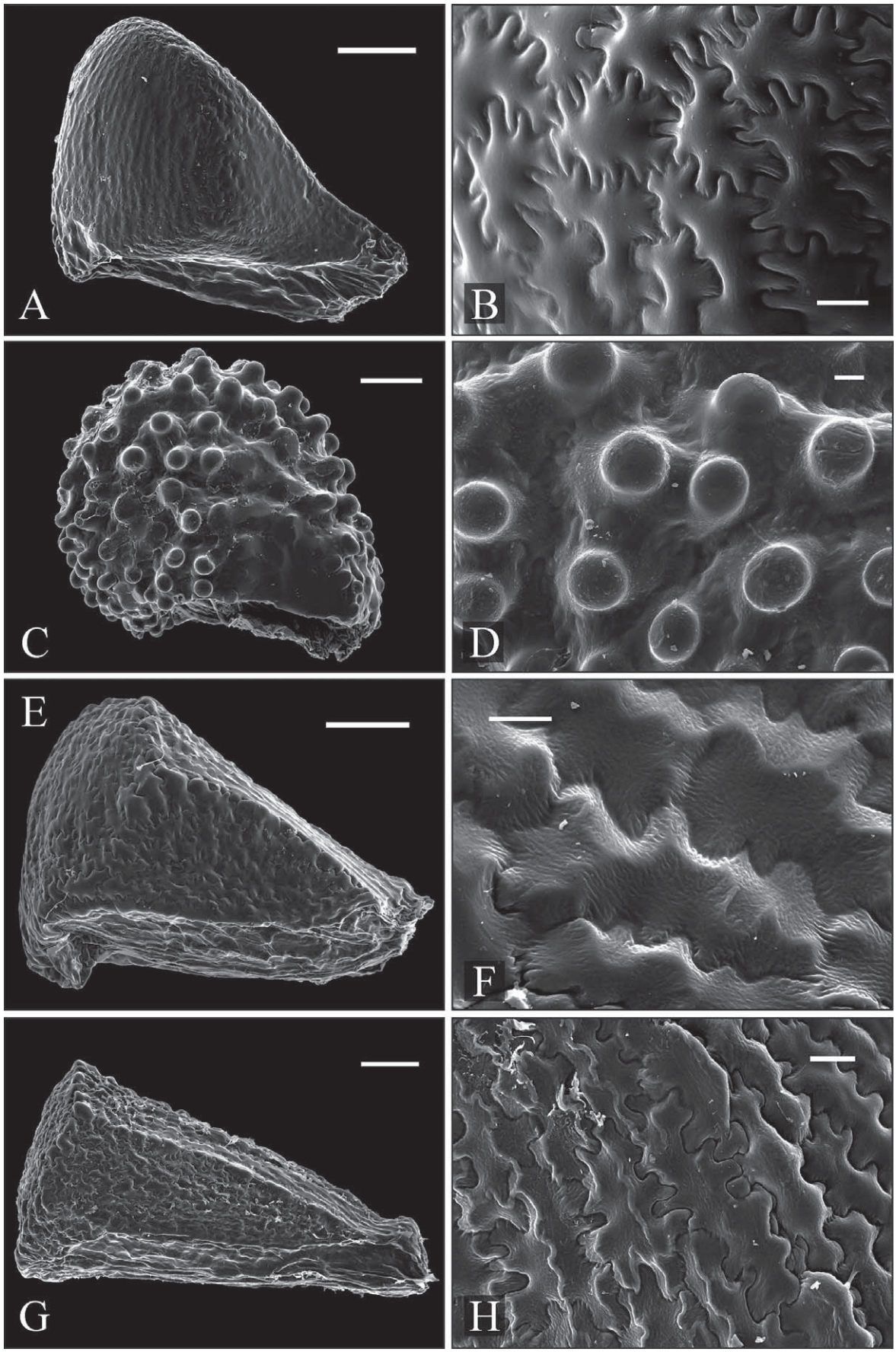

FIGURE 61. A–B, *Ossaea micrantha;* C–D, *O. quadrisulca;* E–F, *O. robusta;* G–H, *O. spicata*. Scale bars: A = 0.08 mm; B = 0.008 mm; C, E, G = 0.06 mm; D, H = 0.01 mm; F = 0.006 mm.

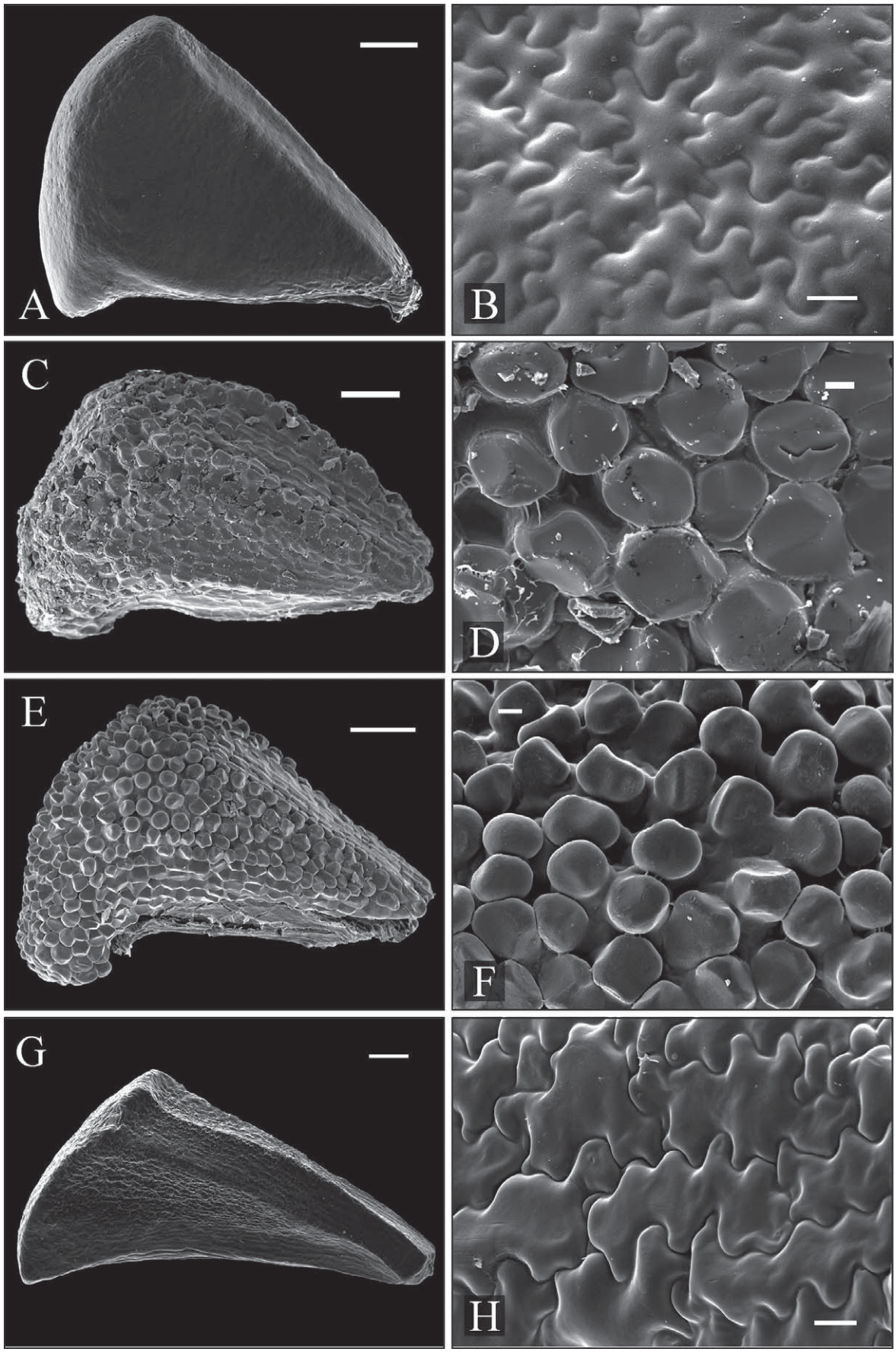

FIGURE 62. A–B, *Pachyanthus lundellianus;* C–D, *Sagraea fuertesii;* E–F, *S. scalpta;* G–H, *Tetrazygia elaeagnoides*. Scale bars: A = 0.12 mm; B, D, F, H = 0.01 mm; C, E, G = 0.1 mm.

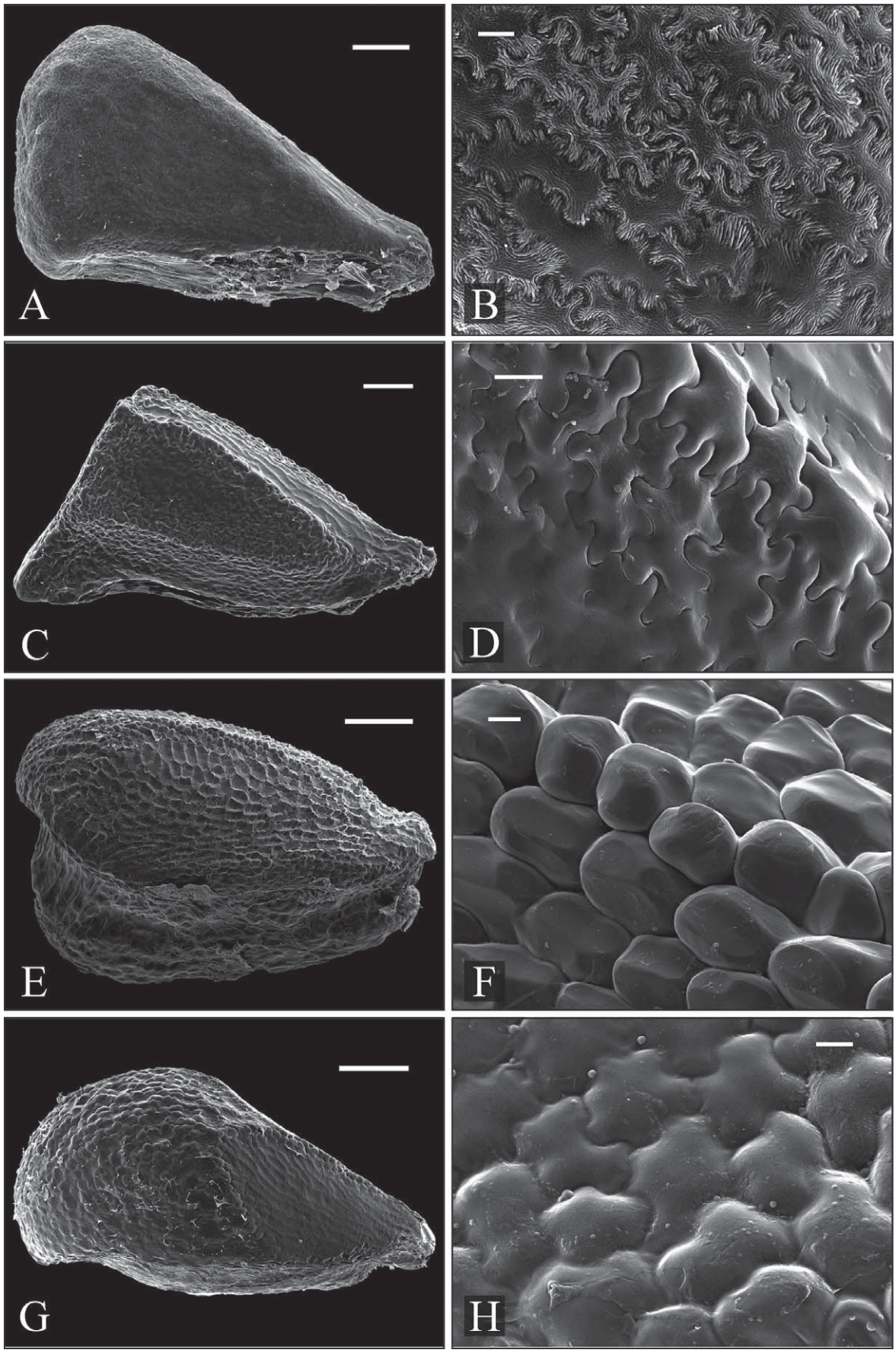

FIGURE 63. A–B, *Tetrazygia urbaniana;* C–D, *Tococa caquetana;* E–F, *T. macrophysca;* G–H, *T. nitens*. Scale bars: A = 0.08 mm; B, F, H = 0.01 mm; C = 0.06 mm; D = 0.008 mm; E, G = 0.2 mm.

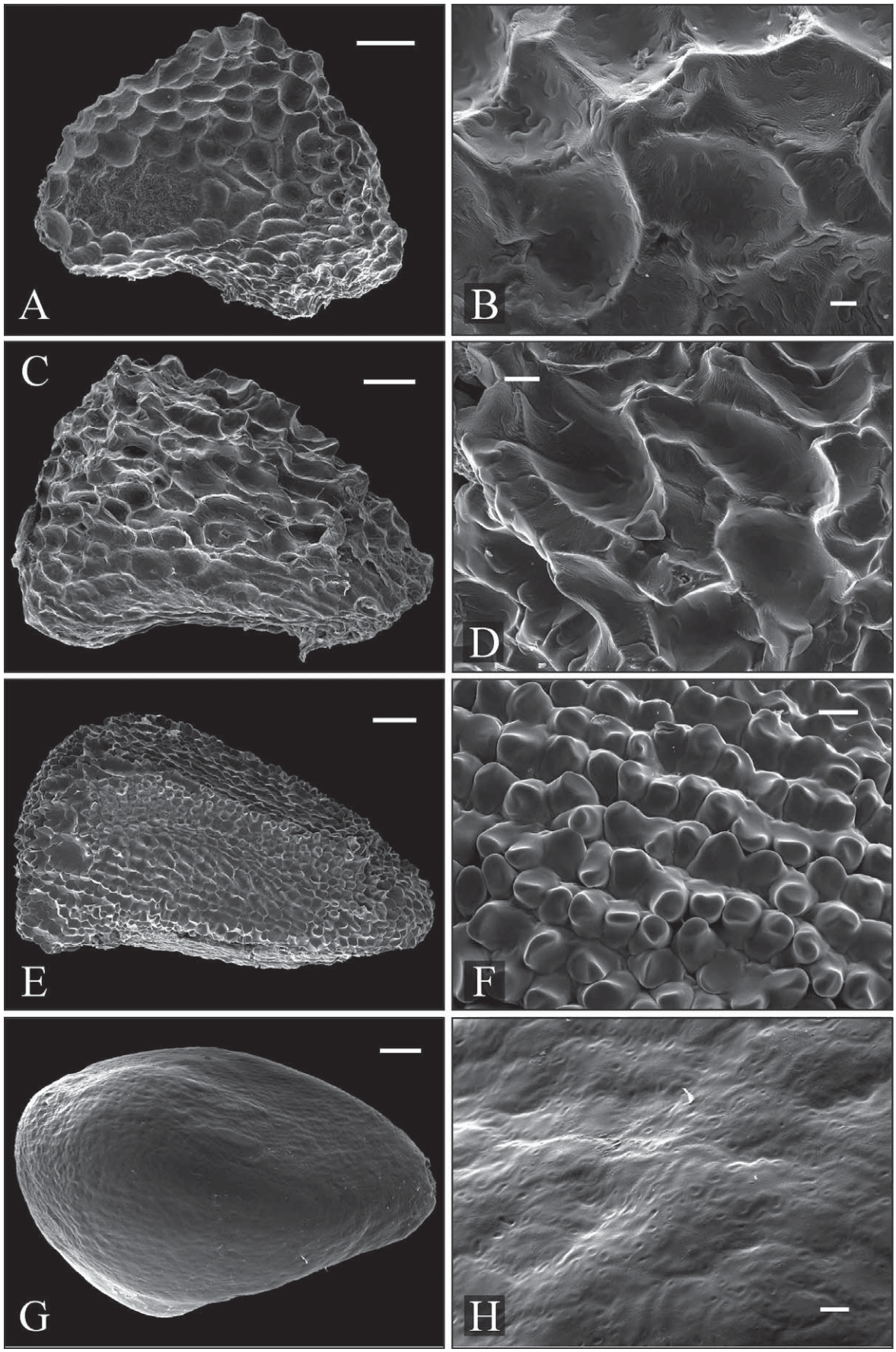

FIGURE 64. A–B, *Tococa perclara;* C–D, *T. platyphylla;* E–F, *T. quadrialata;* G–H, *T. rotundifolia*. Figure G in antiraphal view. Scale bars: A, E = 0.1 mm; B, H = 0.01 mm; C = 0.09 mm; D, F = 0.02 mm; G = 0.2 mm.

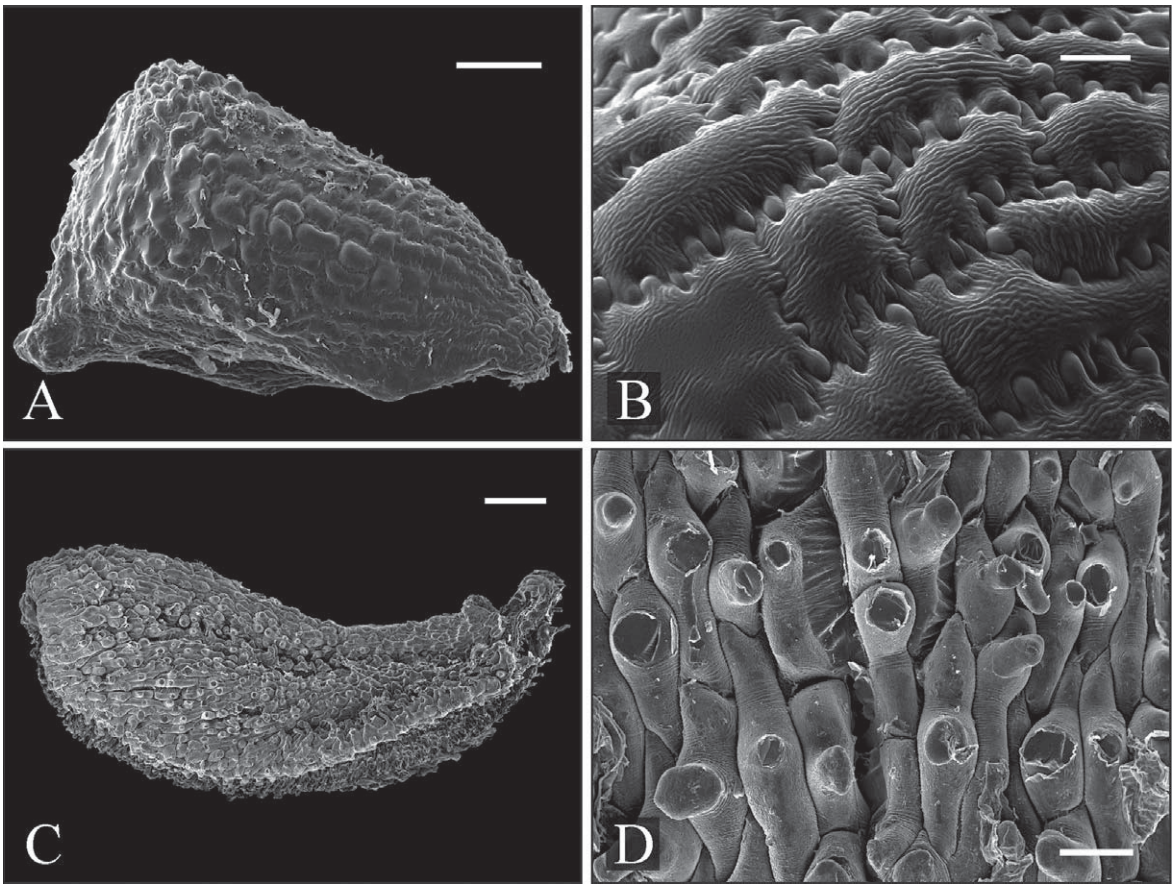

FIGURE 65. A–B, *Tococa spadiciflora;* C–D, *T. subciliata*. Scale bars: A = 0.06 mm; B = 0.008 mm; C = 0.3 mm; D = 0.005 mm.

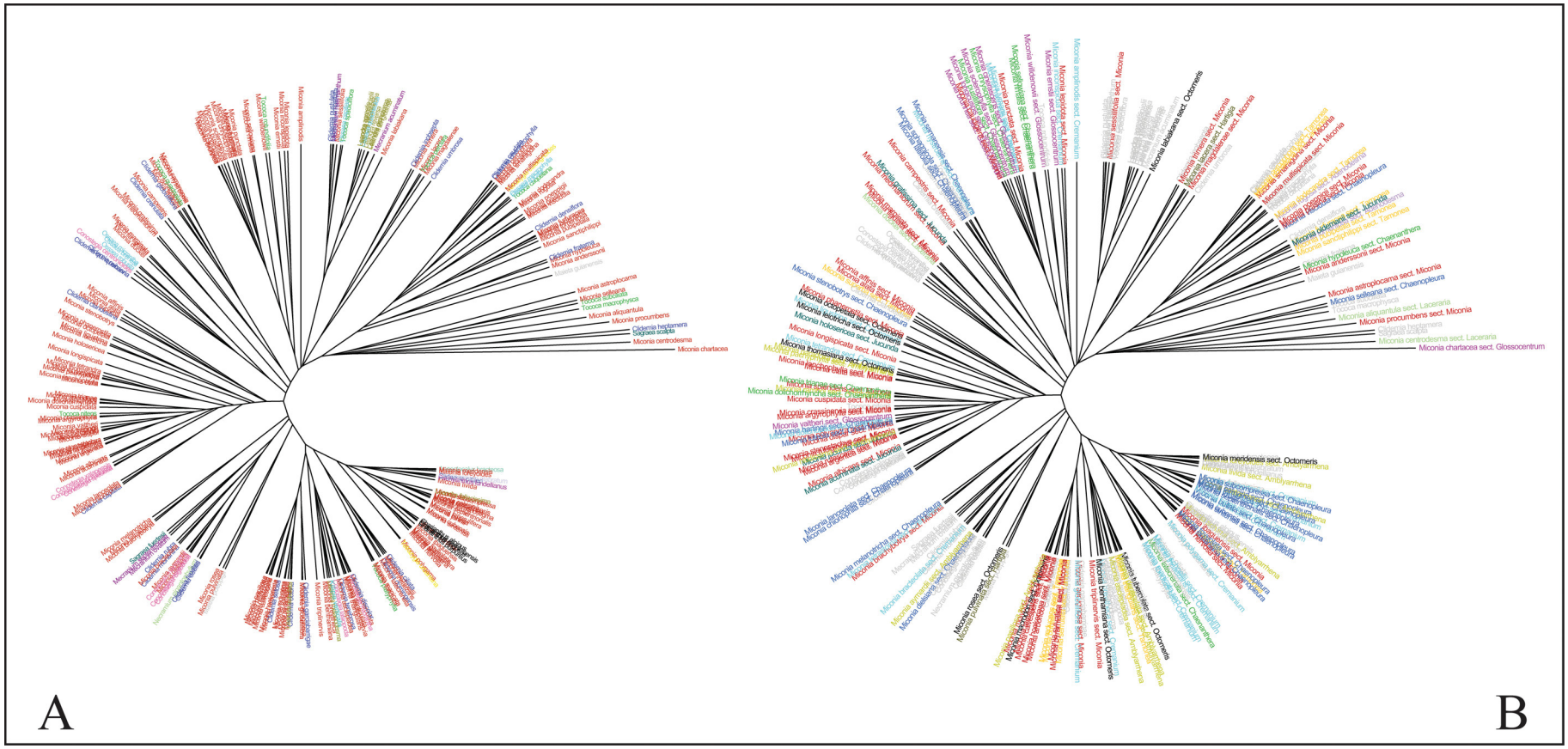

FIGURE 66. Unrooted UPGMA trees showing the phenetic relationships among the species of Miconieae using seed morphological data. A, samples colored according to their generic ad-scription. B, species of *Miconia* colored according to their traditional sectional placement (species from other genera are shown in gray). Note that in neither case the Miconieae genera or the sections of *Miconia* form discrete groups.