

Three new *Buxus* species (Buxaceae) from eastern Cuba

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EGON KÖHLER

Three new *Buxus* species (*Buxaceae*) from eastern Cuba

Abstract

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Three Cuban species of the genus *Buxus*, endemic to the Sierra de Moa-Baracoa mountain system, are described as new to science. Besides morphological descriptions, the results of a character analysis including pollen morphology, leaf venation and leaf anatomy are presented, which contribute to the delimitation of the species and the clarification of their relationships.

Key words: taxonomy, systematics, palynology, leaf anatomy, micromorphology, scanning electron microscopy.

Introduction

In America the genus *Buxus* possesses a marked centre of diversity in Cuba. Here the highest number of species – up to forty – is found, representing its greatest morphological and phylogenetic diversity. The eastern Cuban Sierra de Moa-Baracoa mountain system, with large amounts of ancient serpentine, are considered as the evolutionary centre of the Cuban and in part also the Caribbean Flora.

In the course of comprehensive collecting expeditions within the ‘Flora Cuba Project’ (1975-90) and with excursions aimed at the completion of the *Buxus* collections during the past decade (1995-2003), sponsored by Mrs Elizabeth and Dr Mark Braimbridge and, in part, by the American Boxwood Society, a large number of *Buxus* specimens has been collected. These collections represent all but three species described so far and include several critical or new taxa.

Plants from the different locations were brought to La Habana, where a comprehensive National Collection of *Buxus* has been build up at the National Botanic Garden of the University of La Habana (Rankin & al. 1999, Köhler 2001, 2004).

The relatively simple flowers of *Buxus* exhibit a limited number of morphological characters which may conceal parallel developments. For this reason an overall character analysis was conducted including pollen morphology (Köhler 1979, 1981), leaf venation (Köhler 1984), leaf anatomy (Köhler & Schirarend 1989) with scanning electron microscopy (SEM) of surface pattern of

epidermal cells (Köhler 1982, 1987), chromosomal studies (Köhler & Schmidt, in prep.), and – still in process – a DNA analysis (see Köhler 1985, Köhler & Brückner 1990).

The characters of the pollen exine are often more indicative for the recognition of the different groups (Köhler 1994) and for species delimitation than the sometimes confusing morphological characters which reflect parallel developments.

***Buxus yunqueensis* E. Köhler, sp. nov.** – Fig. 1-9.

Holotypus: Guantánamo, Baracoa, Subida al Yunque de Baracoa, alt. 505 m, 20°20.711'N, 74°34.131'W, 30.9.2000, E. Köhler & F. Hoffmann HFC 78088 (HAJB, isotypi: B, BHU).

Frutex vel arbor usque ad 5 m altus; truncus cortice griseo anguste fissurato; rami vetustiores cortice cinerascete-brunneo, longitudinaliter dehiscente striato suberoso, rami hornotini quadrangulati vel hexangulati, sulcis ex interstitiis foliorum decurrentibus, superne angustis, inferne latioribus, margine alato, glabri vel minute patenter pilosuli, internodiis 1-2.5 cm longis, heterophyllis. *Folia* breviter petiolata (3-5 mm), ovato-lanceolata usque ad lanceolata, basi obtusa vel acutiuscula, apice acuta vel sensim acuminata, 4-7(-9) cm longa, 2-4 cm lata, nervo medio supra ad basim anguste impresso, subtus prominente, nervis lateralibus utrinque 8-10, sub angulo 45-55° abeuntibus, 1.5-4 mm ante marginem anastomosantibus, venulis reticulatis supra et subtus prominulis, margine paullum revoluta, papyracea, glabra; lamina in sicco viridis, vix nitens, subtus pallidior; folia bracteiformia supra interstitium euphyllorum abeuntia, 1.5-2 mm longa, ovata, acuta, glabra vel brevissime pilosula. *Inflorescentiae* axillares subsessiles, glomeratae, bracteis late ovatis, acutis, 1-2 mm longis, carinatis, ciliolatis. *Flores masculi* 6-8 decussati, sessiles, sepalis ovatis, acutis vel breviter acuminatis, exterioribus angustioribus, dense ciliolatis, in carina et apice intus pilosulis. *Stamina* sepalis duplo longiora, 3-4 mm longa, prominentia, filamentis gracilibus, antheris ovatis, 0.8 mm longis, connectivo producto, vix fuscato. *Grana pollinis* pantoporata, 9-12 poris, diametro 20-22 µm, sphaeroidea, exinio reticulato, microspinuloso, c. 2 µm crasso. *Ovarii* rudimentum quadrilobulatum, lobulis paulo dilatatis, 1 mm protuberantibus. *Flores femineae* solitariae sessiles, bracteis sepalis conformibus, sepalis late ovatis, acutis vel sensim acuminatis, carinatis, 2 mm longis, margine ciliolato, in carina et apice intus dense pilosulis. *Ovarium* rotundato-triangulosum, 2 mm longum, 1.8 mm in diametro, commissuris leviter impressis, nervis dorsalibus supra valde impressis, glabrum, stylis erectis, 1.5-2.5 mm longis, basaliter applanatis, $\frac{2}{3}$ parte superiore stigmatosis, stigmatibus late linearibus, sulcatis, leviter recurvatis, gibberibus interjectis triangularibus, prominentibus, 0.8 mm longis, glabris. *Capsulae* ovoideae, 5 mm in diametro, nervis dorsalibus prominulis, commissuris basaliter et apicaliter profunde impressis, glabrae, cornibus erectis, in apice stricti, 2-2.5 mm longis, gibberibus interjectis prominulis, globosulis vel trigonaliter protrudentibus, glabrae, brunneae. *Semina* rotundato-triangulosa, 2.5 mm longa, nigra nitida. – Numerus chromosomatum: $n = 14$. – Apr.-Mai. flores, Aug.- Oct. fructus.

Distribution. – Only few, mostly sterile collections of this species exist so far from the Yunque de Baracoa. The species grows at 400-700 m as shrub or small tree in submontane rainforest and evergreen forest on the steep northeastern limestone slopes together with *Coccothrinax yunqueensis* Borhidi & O. Muñiz, *Sapium jamaicense* Sw., *Calycogonium plicatum* Griseb. and species of *Columnnea* and *Gesneria*. The anvil-shaped Oligocene massif of the Yunque consisting of limestone and dolomite has an annual precipitation of 1000-2200 mm. It represents a rich evolutionary centre, which includes the habitat of the endemic genus *Ekmania* and of about 25 endemic species. A population with smaller leaves is recorded from the Sierra del Puriales (up to 1100 m) with a wet tropical and mountain rainforest climate and predominating tropical brown soils ('Purialense', Borhidi 1992).

Additional specimens seen. – GUANTÁNAMO: BARACOA: YUNQUE DE BARACOA: Alain & al. 7528 (HAC, HAJB); Bisse & al. HFC 40166 (B, BHU, HAJB, JE); Berazaín & al. HFC 71539 (BHU, HAJB); 505 m, 20°20.711'N, 74°34.131'W, Gutiérrez & al. HFC 79696 (BHU, HAJB); Sierra del

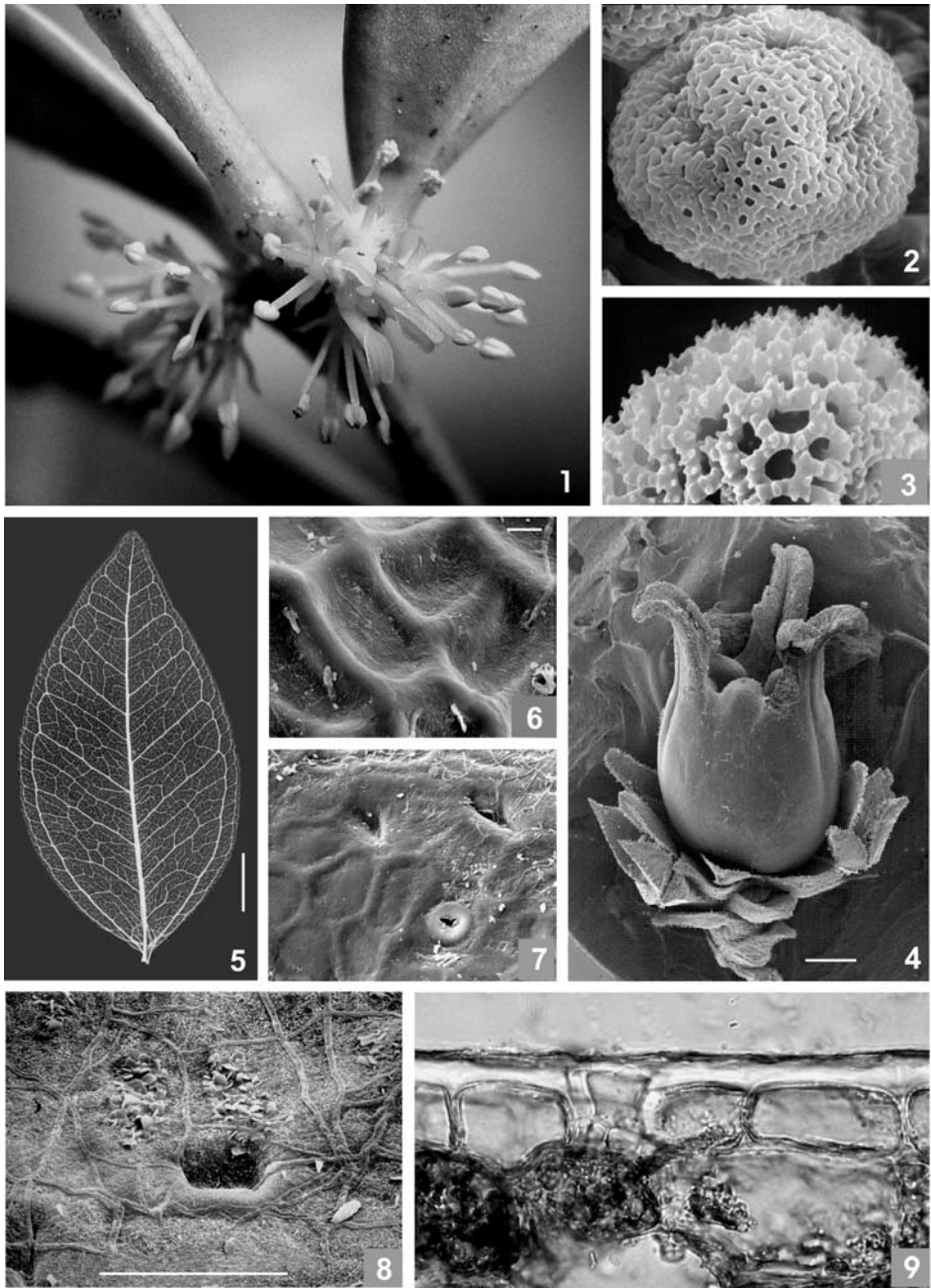


Fig. 1-9. *Buxus yunquensis* – 1: inflorescence; 2: pollen grain, 4300 $\times$; 3: exine detail, muri with small spinules 7500 $\times$; 4: gynoecium, postfloral, c. 10 $\times$; 5: brochidodromous leaf venation pattern, scale bar = 1 cm; 6: adaxial leaf epidermis pattern with raised anticlinal walls and sunken periclinal walls, scale bar = 10 μ m; 7: abaxial leaf epidermis pattern, stoma without a peristomal rim and two collapsed sclereids, 550 $\times$; 8: detail of a sclereid with collapsed thin outer wall; 9: cross section of a sclereid in the adaxial epidermis with strongly thickened inner walls and a thin periclinal wall. – 1, 5+6 from a plant of the type collection cultivated in the National Botanic Garden La Habana, 2+3 from HFC 77518, 4+7 from HFC 78088, 8+9 from HFC 19584.

Purial, la Gurbia, 700 m, *Bisse & al. HFC 8845* (HAJB, JE); Holguin, Moa, Nuevo Mundo, cerca del aserrío, *Bisse HFC 19584* (HAJB, JE); La Granjita, cult. in Jardín Botánico Nacional, 1987. Parque Nacional Alejandro de Humboldt, río Palmarito, 500-532 m, 20°24.309'N, 74°55.102'W, *Gutiérrez & al. HFC 78248, HFC 80642, 80646* (BHU, HAJB).

Notes. – The new species has comparatively large, ovate to narrowly lanceolate leaves with slightly acuminate tip. The specimens from the Yunque are easily distinguishable from *Buxus acuminata* occurring in the same habitat, which has twice as large leaves with up to 16 secondary veins, remarkably brown-variegated when young. Its gynoeceum is trigonal, 6-furrowed with deeply sunken dorsal veins and flatter commissural rims and has large triangular interstylary nectaries, the capsules are nearly twice as large, shallowly 6-furrowed with very prominent nectaries. Its internodal folds are broader, with more strongly winged rims. According to the three-dimensionally interwoven ridges of the exine this species belongs to the *B. bissei* group.

Earlier collections of the new species were in part determined as *Buxus ekmanii*, occurring at higher elevations of the Yunque. *B. ekmanii* has thicker, coriaceous, ovate to ovate-elliptic leaves of similar size, with a denser venation. It develops densely imbricate bracts; the outer male sepals are boat-shaped, cream-coloured, with densely pubescent margins and tips. The stamens have broad, attractive, white filaments and the gynoeceum possesses well developed interstylary nectaries with pronounced margins. The internodal folds are very broad apically, and the rims and median ridge of the decurrent leaf trace are winged. *B. ekmanii* is close to the *B. bissei* group.

The reticulate exine with undulating muri beset with small spinules (Fig. 2-3) of *Buxus yunquensis* fits in the *B. glomerata* type (Köhler 1981), which is found in 9-10 species from the eastern Cuban mountains. Its pantoporate pollen grains, stomata without a peristomal rim and glabrous gynoecea with slightly protruding interstylary nectaries indicate a close relationship to *B. glomerata*, *B. jaucoensis* and *B. leivae* (Köhler 2003).

Buxus glomerata is a common species in the dry forests on limestone close to the southern coast from Cienfuegos to Maisí, with smaller (2-4.5 cm long), elliptic-lanceolate leaves. The inflorescences contain similar numbers of flowers, but the male sepals are oblong-elliptic, obtuse with a ciliate, membranous margin, whereas in *B. yunquensis* they are ovate-lanceolate, and acute to acuminate. The ovary and capsule of *B. glomerata* are similar but smaller than in *B. yunquensis* (Fig. 4). The local endemic *B. jaucoensis* from the limestone rocks of the Rio Jauco is easily distinguishable by its narrow-elliptic to obovate, acute leaves with whitish green colour produced by the papillate epidermal cells of both surfaces (Köhler 1982).

Finally, *Buxus yunquensis* is presumably most closely related to *B. leivae*. These are shrubs or small trees on serpentine in the montane rainforests of the Sierra de Moa and the Altos de Iberia, with obovate, obtuse or slightly retuse leaves which are narrowed into the petiole and only $1/3$ - $1/4$ the size of those of *B. yunquensis*. The internodal folds are narrow, scarcely winged and become soon greyish-shiny with longitudinal tears. The bracts and sepals as well as the gynoeceum and the mature capsules are much smaller (Köhler 1998). Both species agree closely in leaf anatomical characters, e.g. in the adaxial epidermal pattern with broad, elevated anticlinal walls with sunken borders and sunken periclinal walls, often beset with wax plates. The abaxial epidermis develops sclereids with thickened inner walls and thin outer walls that easily collapse, producing peculiar holes in the surface (Fig. 7-9). *B. leivae* and *B. yunquensis* obviously form a pair of closely related species reflecting the edaphic differentiation on serpentine and limestone. While the serpentine taxon in general displays more primitive characters, especially in leaf venation where a low number of secondary veins delimitates larger, irregular intercostal areas with ramifying veins, *B. yunquensis* from limestone appears more highly evolved with respect to venation organization (Fig. 5) and leaf anatomical characters.

Microchemical analysis (Reeves & al. 1996) resulted in comparably low values of Ni, Cd, Co and Cr for the Yunque population of *Buxus yunquensis* but high Al values for the specimens from Nuevo Mundo (A. Baker, pers. comm.).

***Buxus triptera* E. Köhler, sp. nov.** – Fig. 10-18.

Holotypus: Holguín, Moa, km 26 del camino a La Melba, alt. 360 m, 20°28'33"N, 74°49'59"W, 3.4.1999, J. Gutiérrez, E. Köhler, R. Rankin & I. Silva HFC 77516 (HAJB; isotypi: B, BHU).

Frutex vel arbor, usque ad 4 m altus; rami hornotini teretes striati vel subangulati, sulco angustissimo ex interstitiis foliarum decurrente, glabri, rami vetustiores cortice cinerascens-brunneo, longitudinaliter suberoso dehiscente, internodiis 3-6 cm longis, heterophyllis. *Folia* petiolis 4-6 mm longis, ovato-oblongata vel elliptica, antice obtusa, leviter retusa, apice minute mucronulata, basi obtusa vel rotundata, breviter angustata, 4-8.5 cm longa et 3-4.5 cm lata, nervo medio supra per totam longitudinem tenuiter impresso, subtus prominente, nervis lateralibus utrinque 12-18 sub angulo 65-70° abeuntibus, 1.5-2.5 mm ante marginem conjunctis, utrinque prominulis vel subtus obsoletis, coriacea, supra flavido-virentia, vix nitentia, subtus pallidiora, opaca, margine tenuiter revoluta, glabra; folia bracteiformia supra interstitium euphyllorum abeuntia, oblongo-lanceolata, carinata, 6-7 mm longa, glabra. *Inflorescentiae* axillares, subsessiles, 6-10 mm longae; bractae anguste triangulares, acutae, 1-2 mm longae, supra ad marginem breviter ciliolatae. *Flores masculi* 6-9, pedicellis 2.5-6 mm longis, sepalis triangulatis acutis vel acuminatis, 1.5-2 mm longis, intus ad medianum pilosulis. *Stamina* sepalis duplo longiora, 3 mm longa, filamentis complanatis, 0.8 mm latis, antheris oblongo-ellipticis, 1-1.2 mm longis, connectivo in mucronem obscuro obtuse producto. *Grana pollinis* 3-(4) colpata, colpibus 3-4 oratis, sphaeroides, diametro 20-22 µm, exinio 2 µm crasso, crassiuscule reticulato, muris transversaliter striatis vel crenulatis. *Ovarii* rudimentum semiglobosum, 1.5 mm diametro, rugosum, vivum aurantiacum. *Flores femineae* solitariae, sessiles, bracteis sepalis conformibus, sepalis late ovato-triangulatis, acutis vel breviter acuminatis, 1.2-1.5 mm longis, intus ad marginem ciliatis. *Ovarium* tripterum, 2 mm altum, alis tenuibus conspicuis, transiens in stylis late disjunctis, horizontaliter vel oblique patentibus, 4-5 mm longis, nervis dorsalibus anguste impressis, stigmatibus anguste linearibus, radiatim strictis, a latere complicatis, 4 mm longis, apice mucronulata, gibberibus interjectis verruciformibus, minutis (0.4 mm), interdum nullis, glabrum, vivum conspicue niveum. *Capsula* triptera, ovario globoso, 8 × 8 mm, nervis dorsalibus prominulis, commissuris apicaliter paulo impressis, cornibus grandibus, late triangularibus, strictis vel leviter recurvatis, horizontaliter vel oblique patentibus, 10 mm longis, ¾ parte superiore anguste stigmatis, gibberibus interjectis paulo prominulis vel nullis, glabra, brunneolo-iridis, nitens. *Semina* rotundato-triangulosa, 6 mm longa, nigra, nitida. – Numerus chromosomatum $n = 14$. – Febr.-Apr. flores, Apr.-Jun. fructus.

Distribution. – The new species is distributed in moist submontane rainforest on the most humid N and SE slopes of the Sierra de Moa at 350-800(-900) m, in an area near La Melba, together with *Sideroxylon jubilla* (Urb.) T.D. Penn., *Moacroton ekmanii* (Urb.) Croizat, *Bonnetia cubensis* (Britton) R.A. Howard, *Mettenia acutifolia* Britton & P. Wilson. This area with predominating very old red ferritic soils is considered the evolutionary centre of the Cuban flora, very rich in species of *Leucocroton*, *Lyonia*, *Moacroton*, *Eugenia* and *Calycogonium*. In a comparatively small area 5-6 other *Buxus* species from different groups occur. The annual precipitation varies between 1400 and 3000 mm.

The new species grows in small valleys with running water during the rainy season, in shady places with dense vegetation on lateritic soil over serpentine.

The southernmost collections were made in the Sierra de Imias, where the species grows up to 800-900 m in habitats more similar to those of *Buxus excisa*.

Additional specimen seen. – HOLGUÍN: Moa, La Melba, cerca del aserrio, 500 m, Bisse & Lippold HFC 11530 (HAJB, JE); ibid., Bisse HFC 15376 (HAJB, JE); camino La Melba, km 26, 20°28'33"N, 74°49'59"W, 360 m, Gutiérrez & al. HFC 77518 (BHU, HAJB), Gutiérrez & al. HFC 78023 (BHU, HAJB), Gutiérrez & al. HFC 80822, 80824 (BHU, HAJB); Guantánamo, Baracoa, Río Jiguani cerca de Mina Yarey, Bisse & Berazaín HFC 22064, 22070 (HAJB, JE); Guantánamo, Sierra de Imias, Los Lechugos, 800-900 m, Arias & al. HFC 53369, 53378 (B, BHU, HAJB, JE).

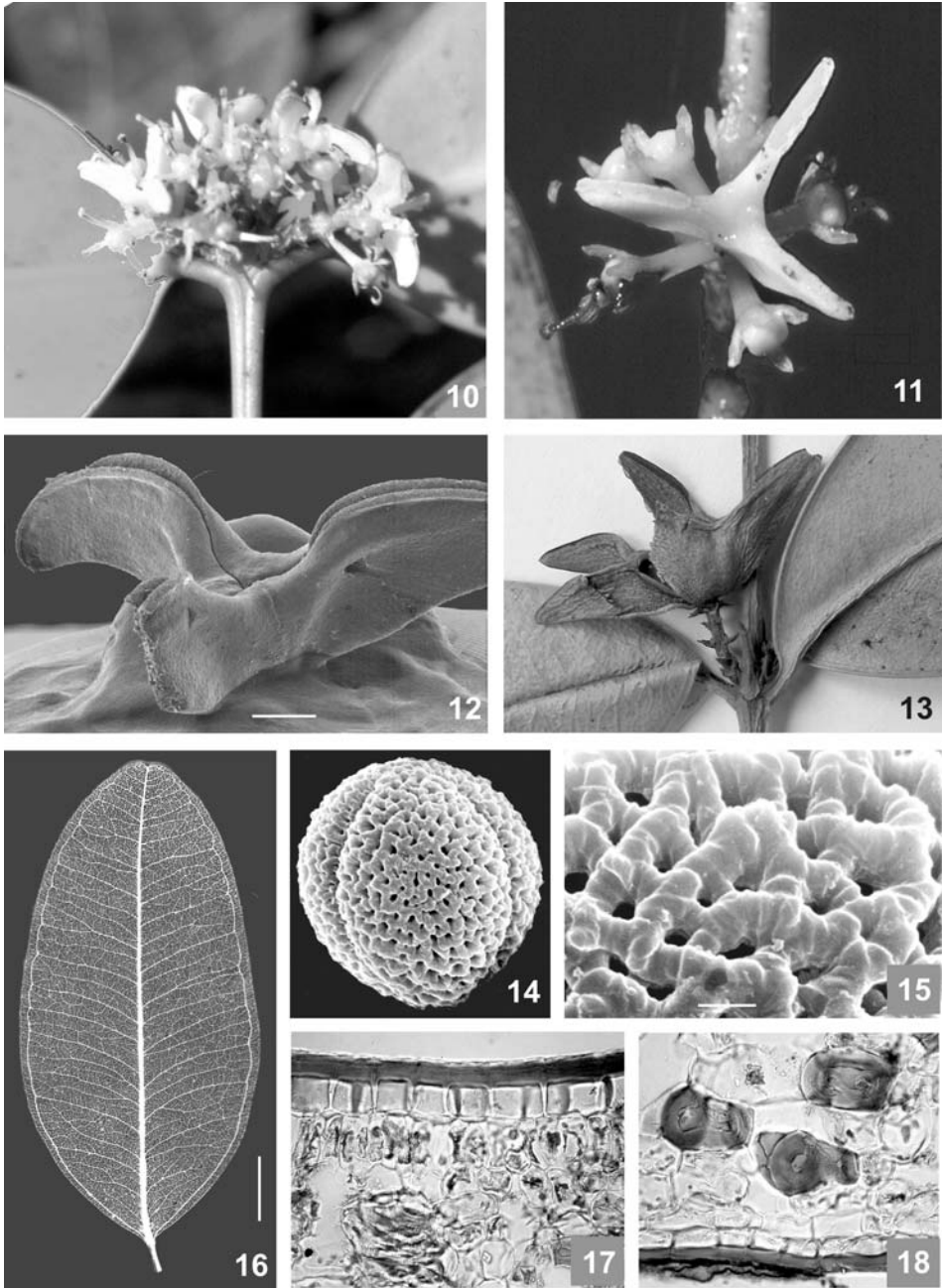


Fig. 10-18. *Buxus triptera* – 10: inflorescence with large white stylodia; 11: straight stylodia, basally with small interstyly nectaries in between, and large ovary rudiments in the male flowers; 12: young fruit, SEM, scale bar = 1 mm; 13: mature capsule, pronouncedly winged; 14: tricolporate pollen grain, 3400 $\times$; 15: exine detail with broad, crenulate muri, 14000 $\times$; 16: leaf venation pattern, brochidodromous with numerous, nearly parallel, partly ramified secondary veins, scale bar = 1 cm; 17-18: leaf cross sections, adaxial epidermis with weakly differentiated palisade parenchyma, without sclereids (17), abaxial epidermis with large, pitted sclereids in the mesophyll (18). – 10-13, 16 from HFC 77516, 14-15, 17-18 from HFC 77518.

Notes. – *Buxus triptera* is closely related to *B. excisa* by the presence of winged gynoeceia. While in *B. excisa* the ovary wings are continuing straight into upright, laterally flattened stylodia, they form nearly horizontal or slightly oblique, very broad stylodia with a mucronulate tip in *B. triptera* (Fig. 12). Its stylodia are more than twice as long, broadly triangular, standing off $\pm$ horizontally, propeller-like, in the mature capsule (Fig. 13), while they are strictly upright in *B. excisa*.

Buxus excisa is a shrub or small tree with smaller, more elliptical leaves ($1.5\text{--}4 \times 1\text{--}2.5$ cm) with much shorter internodes (0.6–2 cm) compared with 3–6 cm long in *B. triptera* and is distributed in the sclerophyllous and moist montane rainforests of the higher mountainous areas up to 1000 m of the Sierra de Moa, Alto de Iberia and Pico Galano, where old red ferritic soils predominate. *B. triptera* comprises small trees with leaves twice or three times as large, ovate-oblongate (4–8.5 $\times$ 3–4.5 cm), of variable form.

The new species can easily be recognized by its larger, showy inflorescences with attractive, white female flowers having small interstylary nectaries only (Fig. 10–12), and by its long, pedicellate male flowers with orange yellow vestigial ovary rudiments. The fruits are at least twice as large as those of *Buxus excisa*, the stylodia are more than 10 mm broad and wing-like (Fig. 13). The younger axes of *B. triptera* are striped with very narrow internodal folds, and the median ridge of the decurrent leaf trace is not edged like in the *B. gonoclada* group, instead there are two weak, variable lateral ridges. The pollen exine has a comparatively coarse reticulum with thick, crenulate muri (Fig. 14–15). This also differs from the *B. gonoclada* group, and is more similar to *B. braimbridgeorum*. *B. crassifolia* has a similar pattern, whereas that of *B. retusa* appears to be further derived with inflated, verruca-like, thickened murus segments.

Buxus triptera and *B. excisa* are characterized by the absence of secretorial elements from the palisade and spongy parenchyma of the leaves and by the occurrence of frequent and often large sclereids (Mathou 1940, Köhler & Schirarend 1989), that underline their particular taxonomic position. *B. triptera* possesses little differentiated palisade tissue, reflecting the more mesophilous and ombrophilous habitats and develops large, pitted sclereids in the spongy parenchyma (Fig. 17–18). The SEM pattern of the adaxial epidermal cells, having narrow, only slightly raised anticlinal walls with sunken borders and scrobiculate periclinal walls beset with rounded raised elements, is similar to *B. braimbridgeorum*, but also to the *B. retusa* group. The stomata possess a peristomal rim.

The chromosome number $n = 14$ was determined for *Buxus triptera* from the specimen HFC 77516 (Köhler & Schmidt, in prep.).

***Buxus braimbridgeorum* E. Köhler, sp. nov. – Fig. 19–25.**

Holotypus: Holguin, Sierra de Moa, Revuelta de los Chinos, pluviosilva de montaña, 700 m, 22.4.1981, J. Bisse, M. Díaz, H. Dietrich, E. Duharte, L. Lepper, B. Mory & C. Sánchez HFC 44813 (HAJB; isotypi: B, BHU, JE).

Frutex vel arbor, 2–12 m altus, ramis hornotinis valde compressis, 2-alatis, sulco angusto vix marginato ex interstitiis foliarum decurrente, glabris, internodiis 0.5–2(–6) cm longis. *Folia* anguste oblongata usque ad elliptica, petiolis 5–8(–10) mm longis, ad basin in petiolum acute contracta eumque marginantia, antice angustata, obtusa et emarginata, in apice ipso minute mucronata, 4–7(–10) cm longa et 1.5–3(–4.5) cm lata, nervo medio sulcato-impresso, subtus prominenter carinato, nervis lateralibus utrinque 13–16 sub angulo 60–70° abeuntibus, 0.5–1 mm ante marginem anastomosantibus, supra prominenter reticulatis, subtus non conspicuis, margine recurvato, supra flavescencia viridia vix nitentia, subtus viridia vel brunescencia, opaca, coriacea, glabra; folia bracteiformia supra interstitium euphyllorum abeuntia sessilia, anguste lanceolata, carinata, 6–7 mm longa, glabra vel paulo ciliolata. *Inflorescentiae* axillares 4–5 mm longae, breviter pedunculatae, bracteis ad basim pedunculi sterilibus minoribus (1 mm), fertilibus ovatis 2–2.5 mm longis, acutis carinatis, in margine sparse et superne intus breviter ciliolatis. *Flores masculi* 4–6, pedicellis 2–3 mm longis, glabris, sepalis ovatis, acutis, carinatis, 1.5–2 mm longis, extus glabris, intus variabilibus tomentosulis. *Stamina* sepalis paulo longiora, 3 mm longa,

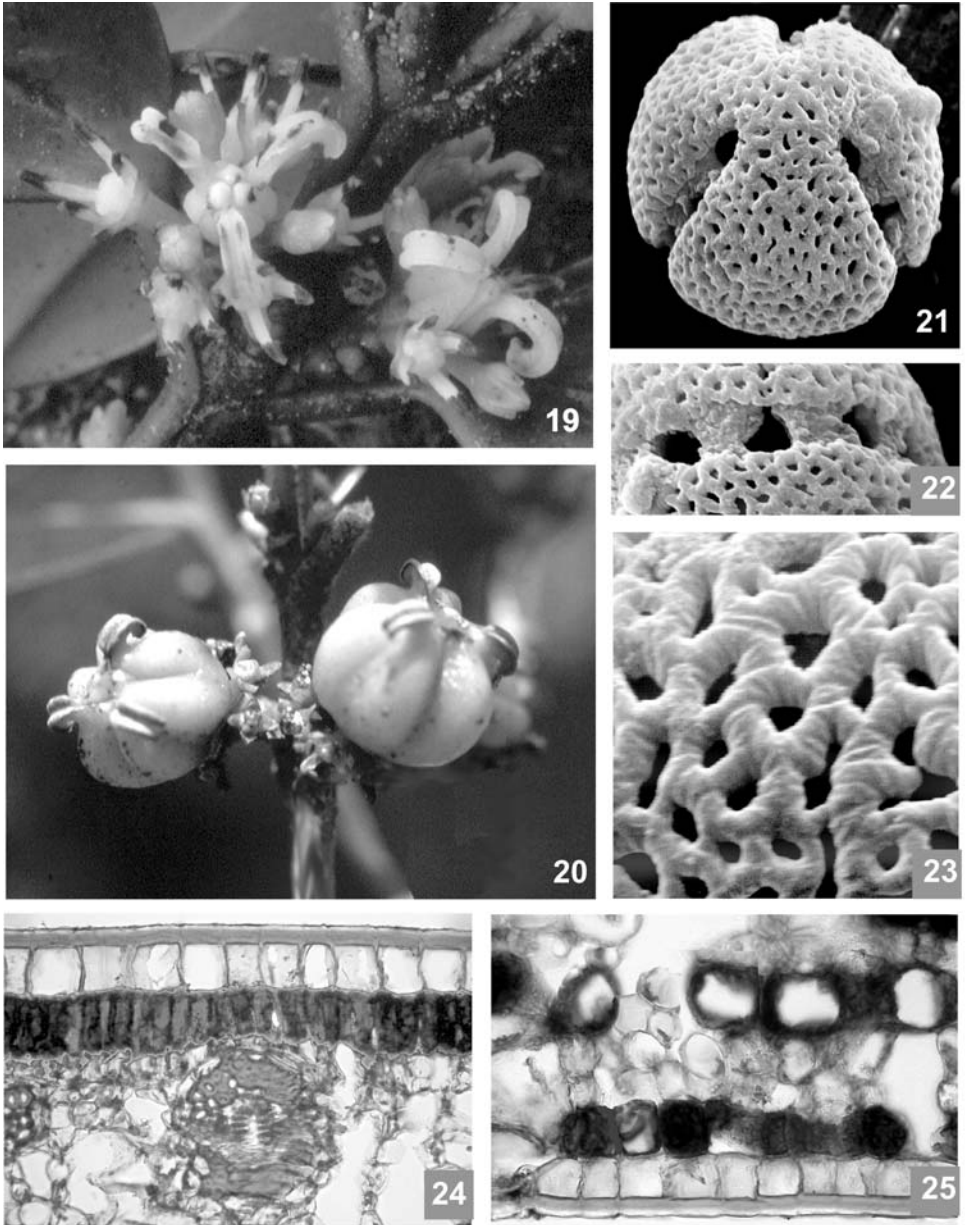


Fig. 19-25. *Buxus braimbridgeorum* – 19: inflorescence, female flowers with long, recurvate stylodia and clearly pointed interstylary nectaries; 20: deeply furrowed, globose capsules; 21: tricolporate pollen grain, 4000 $\times$; 22: colpus with 4 laterally open ora, 6000 $\times$; 23: exine detail with comparatively broad, crenulate muri, 11000 $\times$; 24: leaf cross section, adaxial epidermis with a palisade layer of secretory cells; 25: abaxial epidermis with a nearly complete subepidermal layer of secretory cells and pronounced secretory cells in the mesophyll (*B. retusa* type). – 19 from Stenzel 592, 20 from HFC 77438, 21-24 from HFC 44813, 25 from HFC 448816.

antheris oblongo-ellipticis, 1 mm longis, connectivo in glandulam obscuram producto. *Grana pollinis* 3-4-colporata, colpis (3-)4 oratis, 23 μ m diametro, sphaeroidea, exinio 2 μ m crasso, reticulato, muris crenulatis. Ovarii rudimentum rectangulum, subquadrilobulatum, rugosum, diametro 1.4 mm. *Flores feminei* solitarii sessiles, bracteis sepalis conformibus, sepalis late ovatis vel triangulatis, acuminatis, carinatis, 1.5-2 mm longis, in margine et intus albidotomentosulis. *Ovarium* ovatum, superne longitrorsum 6-sulcatum, 2.5 $\times$ 1.5 mm, glabrum, stylis obliquis, semiorbiculariter recurvatis, 3 mm longis, in $3/4-4/5$ parte superiore stigmatosis, stigmatibus lateraliter late compressis, intus longitrorsum sulcatis, gibberibus interjectis prominenter angularibus vel membranaceis. Capsulae globosulae superne parum attenuatae, 10 $\times$ 9 mm, parte superiore longitudinaliter sulcatae, cornibus arcuato-divergentibus, 3-4 mm longis, gibberibus interjectis crassiuscule membranaceis vel cylindraceis, obviis, glabrae. *Semina* nigra nitida, anguste ellipsoidea, triangulata 5.5 $\times$ 2.5 mm. – Numerus chromosomatum (based on HFC 77581, 77584): $n = 14$. – Febr.-Mai. flores et Apr.-Dec. fructus.

Eponymy. – Dedicated to Elizabeth and Dr Mark Braimbridge, the former owner of the Langley Boxwood Nursery and keeper of the National *Buxus* Collection of Britain, who have made invaluable contributions to the planning and successful realisation of the 10 years collecting programme and the development of the National *Buxus* Collection at the Jardín Botánico Nacional of the University of La Habana by their sponsoring and stimulating discussions.

Variation. – Populations of trees with tall stems, much young growth, densely ramified and densely-leaved branches occur on the Alto de la Galinga. In the northern area the leaves are smaller, apically and basally narrowed, nearly rhomboidal, whereas the plants of the high plateaux are more rigidly ramified and have larger, elliptical leaves. At higher altitudes the capsules are shorter with shorter stylodia and the plants often bear epiphytic lichens and mosses. The branches have numerous flowers, sometimes originating from consecutive bract-like microphylls. The shape of the interstylary nectaries varies from cylindrically projecting humps (Fig. 19) to broad, medially thickened hems.

Distribution. – The new species is distributed in moist montane rainforests and cloud forests on the higher flat ridges and plateaux of the Sierra de Moa, in charrascales on the Loma de la Galinga up to the Meseta del Toldo and on the southern slopes of the Toldo, at 500-1000 m. It grows together with *Miconia alternifolia* (Griseb.) Alain, *Tapura cubensis* Griseb., *Weinmannia pinnata* L., *Ceuthocarpus involucratus* (Wernham) Aiello, *Podocarpus ekmanii* Urb., *Macrocarpaea pinetorum* Alain, *Bisgoeppertia scandens* Urb., *Myrica shaferi* Urb. & Britton and *Hedyosmum nutans* Sw., often in the gallery vegetation of water courses in small valleys. The soil is ferritic, but little developed, often in boulder stocks derived from serpentine and the annual precipitation ranges of 1300-1900 mm. This area possesses a high degree of endemism calculated as up to 85-90 %.

Additional specimens seen. – HOLGUIN: Moa, Camp La Gloria, *Shafer* 8151 (NY); Rio Punta Gorda, *Clemente* 4469 (HAC, IJ); *Mina Potosi*, *Samek* 26847 (HAC); Moa, charrascales en el altiplano de la Sierra de Moa, monte nublado, 600-900 m, *Bisse & Köhler* HFC 6746, 6870 (HAJB, JE); *Bisse & al.* HFC 39939 (B, BHU, HAJB, JE); altos de la Galinga y la ladera de la loma del Toldo, 800 m, *Bisse & al.* HFC 44717 (B, BHU, HAJB, JE); camino al Toldo, 400-500 m, *Claro* HFC 62123 (HAJB); subida al Pico Toldo por ladera norte, 950-1100 m, 20°30'23"N, 74°55'26"W, *Gutiérrez & al.* HFC 77438 (BHU, HAJB); camino entre el Alto de la Galinga y subida por la ladera suroeste al Pico el Toldo, 900-1000 m, 20°32'49"N, 74°54'55"W, *Gutiérrez & al.* HFC 77581, 77584 (BHU, HAJB); Meseta del Toldo, 891 m, 20°29'40"N, 74°54'00"W, *Stenzel* 592 (BHU).

Notes. – *Buxus braimbridgeorum* can easily be recognized by its globose, apically deeply furrowed capsules with short, revolute stylodia standing close together basally. The commissural areas are narrower and much deeper sunken than the broader, flatter dorsal veins (Fig. 20).

Buxus retusa and *B. crassifolia* clearly differ from *B. braimbridgeorum* by their widely spaced stylodia leaving between them the space of the lacking nectaries. The capsule of *B. crassifolia* is also 6-furrowed, but more strongly sclerified resulting in an additional septicial dehiscence. The *B. excisa* group differs by the flattened stylodia, by the strongly developed sclereids in the leaf anatomy and by its internodal pattern, which is not strongly edged like in the following. *B. braimbridgeorum* has a typical gonoclade pattern with narrow internodal folds and a pronounced median ridge of the decurrent leaf base which is first hexangular and then tetragonal-rhombic in cross section. The stomata possess a well developed peristomal rim.

The more uniform reticulum of the pollen exine is similar to that of *Buxus triptera* and *B. crassifolia*, and has comparatively thick, broadly crenulate muri (Fig. 21-23), that distinguish the species from the *B. gonoclada* and the *B. retusa* group s.str.

With subepidermal layers of secretorial cells in both the adaxial and the abaxial epidermis, and additional secretorial cells scattered in the mesophyll, the leaf anatomy of the new species agrees with the *Buxus retusa* group (Fig. 24-25). This is supported by the SEM pattern of the adaxial epidermis, where little raised anticlinal walls with deeply sunken borders and irregularly notched periclinal walls are reminiscent of *B. retusa* but also of *B. excisa*.

Buxus braimbridgeorum demonstrates a remarkably reticulate distribution of characters from different relationship groups. The stems are gonocladic like in the *B. gonoclada* group, but pollen morphology points to the *B. excisa* and *B. crassifolia* group. *B. excisa* is strongly different in leaf anatomy, whereas that of *B. braimbridgeorum* fits well with the *B. retusa* group. The well developed interstylary nectaries differ from the *B. retusa* group but resemble *B. gonoclada*, whereas the SEM leaf surface pattern is very different from the latter and similar to *B. excisa*, and also to *B. retusa*. This reticulate character pattern obviously reflects close relations and a recent speciation of the whole group in the E Cuban mountains.

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References

- Köhler, E. 1979: Ergebnisse palynotaxonomischer Untersuchungen an cubanischen *Buxus*-Arten. – Wiss. Z. Friedrich-Schiller-Univ Jena, Math.-Naturwiss. Reihe **28**: 683-689.
- 1981: Pollen morphology of the West Indian-Central American species of the genus *Buxus* L. (*Buxaceae*) with reference to taxonomy. – Pollen Spores **23**: 37-91.
- 1982: Drei neue *Buxus*-Arten für die Flora von Cuba. – Wiss. Z. Friedrich-Schiller-Univ. Jena, Math.-Naturwiss. Reihe **31**: 239-250.
- 1984: Zur Blattnervatur der neotropischen *Buxus*-Arten und ihre Bedeutung für die Systematik (*Buxaceae*). – Flora **175**: 345-374.
- 1985: Vorstellungen zur Evolution und Chorogenese der neotropischen *Buxus*-Arten. – Feddes Rept. **96**: 663-675.
- 1987: Taxonomical and ecological aspects of scanning electron microscopic (SEM) studies

- of leaf surfaces of the Cuban species of the genus *Buxus* L. (*Buxaceae*). – P. 13 in: Anon. (ed.), Resúmenes IV Conferencia sobre la Flora de Cuba, La Habana. – La Habana.
- 1994: Parallel evolution of pollen characters in the genus *Buxus* L. (*Buxaceae*). – Acta Bot. Gallica **141**: 223-232.
- 1998: Weitere neue *Buxus*-Arten der Flora von Cuba. – Feddes Repert. **109**: 351-363.
- 2001: The establishment of a national collection of native *Buxus* species in Cuba. – Boxwood Bull. **41**: 14-20.
- 2003: Patterns of species differentiation within the *Buxus glomerata*-group on serpentine and limestone mountain systems in the Oriente Provinces of Cuba. – Pp. 13-14 in: Anon. (ed.), Abstracts IV. International Conference on Serpentine Ecology, La Habana, Cuba. – La Habana.
- 2004: The national collection of native *Buxus* species in Cuba. – Topiarius **7**: 12-16.
- & Schirarend, C. 1989: Zur Blattanatomie der neotropischen *Buxus*-Arten und ihre Bedeutung für die Systematik. – Flora **183**: 1-38.
- & Brückner, P. 1990: Considerations on the evolution and chorogenesis of the genus *Buxus* (*Buxaceae*). – Mem. New York Bot. Gard. **55**: 153-168.
- Mathou, Th. 1940: Recherches sur la famille des Buxacées. – Toulouse.
- Rankin Rodríguez, R., Leiva Sánchez A., Silva Pérez, I. & Berazaín Iturralde, R. 1999: *Buxus* cubanos: una colección en el Jardín Botánico Nacional. – Revista Jard. Bot. Nacion. **20**: 5-14.
- Reeves, R. D., Baker, A. J. M., Borhidi, A., Berazaín Iturralde, R. 1996: Nickel-accumulating plants from the ancient serpentine soils of Cuba. – New Phytol. **133**: 217-224. [[CrossRef](#)]

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