

## An Unusual New Species of *Dalechampia* (Euphorbiaceae) from Surinam

GRADY L. WEBSTER and W. SCOTT ARMBRUSTER

Department of Botany, University of California, Davis, California 95616

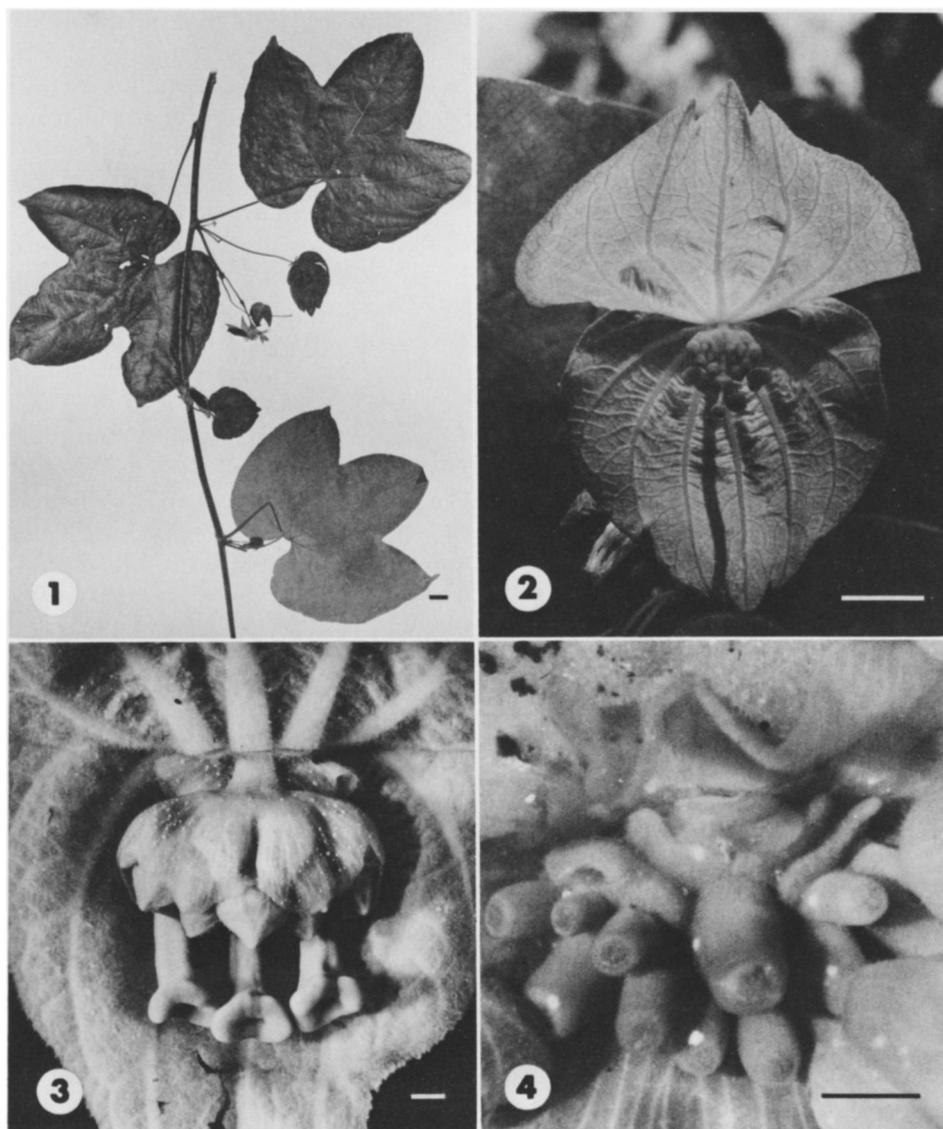
**ABSTRACT.** *Dalechampia brownsbergensis* sp. nov. from Surinam belongs to sect. *Scandentes*. It differs from other members of the section in bearing only small, vestigial resiniferous bractlets and in being pollinated by male euglossine bees. It also differs from the common and somewhat similar species *D. tiliifolia* by having involucre bracts that are green at anthesis and by bearing generally monomorphic trilobate leaves.

Until recently, pollination of *Dalechampia* (Euphorbiaceae) has been known from only a few reports (Armbruster and Webster 1979). During July and August 1979 we expanded our continuing survey of the reproductive biology of species of *Dalechampia* to Surinam. While working in the Brownsberg Nature Preserve in north-central Surinam, we discovered flowering material of a highly unusual, undescribed species. While superficially similar to many "typical" species of *Dalechampia*, this new species is strikingly divergent from other viny species in important details of its inflorescence architecture and in its pollination biology.

***Dalechampia brownsbergensis*** Webster & Armbruster, sp. nov. (figs. 1–4).—**TYPE:** Surinam, Distr. Brokopondo, Brownsberg Nature Preserve, 4°53'N, 55°13'W, along Plateauweg between km posts 7 and 9, openings at edge of rain forest, ca. 500 m, 28 Jul 1979, G. L. Webster and W. S. Armbruster 24124 (holotype: DAV; isotypes: BBS, GH, MO, NY, and additional ones to be distributed).

Sect. *Scandentium*; differt ab aliis speciebus sectionis bracteolis staminibus resiniferis paucis vestigialisque; ab *D. tiliifolia* foliis semper trilobatis, bracteis viridulis, stylis brevioribus.

Clambering vine; stems twining, terete, up to 5 mm thick, growing tip hirsutulous-sericeous with partly retrorse-recurved non-stimulous hairs 0.2–0.5 mm long. Stipules spreading to reflexed, deciduous, elliptic-lanceolate, acute or subacute, entire and nonglandular, indistinctly striate-veined, copiously sericeous-strigose on both faces, 4.5–10 mm long, 2–3.5 mm broad; petiole pubescent as the stem, terete, 4.5–13 cm long, 1–2.5 mm thick; stipels at base of blade 2(–4), lanceolate, blunt, 1.2–2.5 mm long, 0.5–0.8 mm broad, flanked by several reddish, capitate or papilliform glands 0.1–0.3 mm in diam.; leaf blades chartaceous, glabrescent abaxially, persistently and copiously puberulent adaxially with mostly non-stimulous hairs, trilobed (in young plants commonly unlobed or with 1 lateral lobe), 10–22 cm long, 10–25 cm broad; middle lobe ovate, cuspidate, 4.5–11 cm long, 4–9.5 cm broad; base of blade deeply cordate, sinus relatively broad and rounded at end, medially (0.5–)1–2



FIGS. 1-4. Vegetative and floral structures of *Dalechampia brownsbergensis*. Scales in 1-2 = 1 cm; in 3-4 = 1 mm. 1. Leaves and inflorescences. 2. Inflorescence with one staminate flower open. 3. Closeup of inflorescence with staminate flowers in bud. 4. Closeup of staminate cymule, abaxial margin of involucre pulled back to reveal vestigial resiniferous bractlets.

cm across; major veins usually 7 from near the base, secondaries ascending, tertiaries scalariform, veinlet reticulum pale and distinctly prominulous beneath (only larger veins prominulous above; fig. 1); margins plane, subentire, minutely glandular when young. Inflorescences usually

solitary on axillary short-shoots 1.2–2.5 cm long; short-shoots usually with a single reduced trilobate leaf, the blade early deciduous or becoming 2–3 cm long, stipules persistent; peduncles 1.3–4.7 cm long at anthesis. Involucral bracts subequal, slightly convex and green at anthesis, broadly ovate, 2.5–4.2 cm long, 2.5–4.8 cm broad, apically 3-toothed (middle tooth 3–6 mm long, lateral ones 1–2 mm long), cordate and 9–11-veined at base (fig. 2), velutinous on both faces with non-stimulous hairs and with irregularly scattered, dark (in fixed material), roundish, partly imbedded glands 0.05–0.2 mm across; margins plane, appearing entire (minutely and obscurely glandular-denticulate); stipules of outer bract lanceolate, bluntly pointed, sericeous on both faces, 4–6 mm long, 1.2–1.9 mm broad; stipules of inner bract narrowly lanceolate, acute, thinner and paler, 2.5–4(–5) mm long, 0.5–0.9(–1.1) mm wide. Pistillate cymule sessile; involucl of 2 or 3 glandular-punctate bractlets; bractlets striate-veined, sparsely strigose-puberulent adaxially, more densely puberulent abaxially, margins entire or undulate-crenate and eglandular; adaxial bractlets 2, usually fused into a bilobed reniform involucellar lip 2.5–4 mm high and 6.5–8.5 mm wide; abaxial bractlet solitary, overlapped by margins of adaxial bractlets, 2.3–4 mm high, 3.7–5.5 mm wide, crenate apically. Staminate cymule with stout hirsutulous (non-stimulous) peduncle 1.5–2.5 mm long and 1.2–1.5 mm thick; involucl 2-lipped, of connate glandular-punctate bractlets, glabrous, 2–3 mm high, 6.5–8 mm wide; lips of involucl subequal and  $\pm$  parallel, margins nearly entire to undulate-crenate or sometimes lobed or cleft, eglandular (fig. 3); staminate flowers 12–13(11–19), some of the smallest ones reduced or abortive; abaxial bractlets laminar, reduced, non-secretory, irregular in number and development, 0.2–0.5 mm high, 0.5–1.5 mm broad, 0.1–0.2 mm thick (fig. 4). Staminate flowers with stout pedicels 0.5–3(–5.6) mm long, articulated near the top, sparsely and minutely stimulous-hispidulous; mature buds globose to ellipsoidal, minutely hispidulous, 1.5–3 mm long, 0.8–2.1 mm thick; calyx splitting into 3–5 lanceolate, acuminate, reflexed-recurved segments 2.5–3 mm long, 1.2–1.5 mm wide; staminal column slender, (2.5–)3–4 mm long, 0.2–0.4 mm thick, smooth and glabrous except for stimulous hairs near the top; anthers 3–22(usually 5–12); filaments densely stimulous-hispidulous, 0.2–0.3 mm long; anthersacs asymmetric, 0.5–0.7 mm long. Pistillate flowers subsessile at anthesis (pedicel of central flower 1–1.5 mm long); sepals usually 12 in central flower, 10 in lateral flowers, 1.5 mm long at anthesis, laciniate with glandular-capitate processes 2–3.5 mm long; ovary trigonous, 1.5–1.8 mm across, stimulous-hispidulous; stylar column curving upwards, cylindrical but tapering towards base (0.6–0.8 mm thick proximally, 1.4–1.7 mm thick distally), 7–9.5 mm long; stigma asymmetrically trigonous, centrally foveolate, 1.5–2.7 mm across. Central fruiting pedicel ca. 1.5 cm long; fruiting sepals linear-lanceolate, ca. 15 mm long, 0.7–1 mm broad across midstrip; marginal glandular-capitate tentacular processes mostly 2–3.5 mm long, copiously furnished with straight, sharp, non-stimulous hairs

1–3 mm long. Fruits trigonous in outline; capsule valves 7.5–8 mm long, brownish, glabrate, prominently raised-reticulate; endocarp woody, 1–1.3 mm thick; columella distally expanded, ca. 4 mm high. Seeds globose, smooth, veiny, brownish-mottled, ca. 3.7 mm in diam.; hilum elliptic-oblong, ca. 1.5 mm long.

This species is so far known only from the Brownsberg Plateau in north-central Surinam, where it is a fairly common vine in the forest canopy and in open areas in evergreen rain forest. Although there are still no detailed published descriptions of the vegetation of Brownsberg, the forest appears to be similar to the plateau rain forests of Stofbroekoeberg as described by Schulz (1960). We have not discovered any earlier collected herbarium specimens of this *Dalechampia* from Brownsberg or from elsewhere in Surinam, but it seems quite possible that it may be discovered in other upland localities.

In aspect of both foliage and inflorescences, the Brownsberg *Dalechampia* resembles the common and widespread *D. tiliifolia* Lam. However, it differs vegetatively from *D. tiliifolia* in its monomorphic (at least in flowering plants) trilobate leaf blades (fig. 1); its involucre bracts, although similarly broad and apically tricuspidate (fig. 2), are greenish at anthesis rather than creamy white as in *D. tiliifolia*. The styles of *D. brownsbergensis* are usually shorter and much more thickened distally than those of *D. tiliifolia*. The staminal involucre in *D. brownsbergensis* produces more staminate flowers (usually 12 or 13 vs. 9 or 10 in *D. tiliifolia*) that have fewer stamens with smaller anthers.

The most obvious difference between the inflorescence of *D. brownsbergensis* and that of *D. tiliifolia* is in the nature of the staminate bractlet complex. In *D. tiliifolia*, the bractlets are conspicuous and obviously resiniferous, whereas in the new species the complex is reduced to a few inconspicuous flanges within the involucre on the abaxial side of the staminate cymule (figs. 3–4); these vestigial bractlets appear to be non-secretory. The faint but distinctive odor of the pseudanthium of *D. brownsbergensis* may be explained by the scattered, dark, punctiform glands that occur on the involucre bracts as well as the staminal and pistillate involucels. These small, dark glands are unique to *D. brownsbergensis*, so far as we know.

Within sect. *Scandentes*, as construed by Pax and Hoffman (1919), *D. brownsbergensis* appears to show more similarities to *D. tiliifolia* than to most other species. In the treatment of the Brazilian species by Mueller (1874), the Surinam plant would key closest to *D. tiliifolia* or to *D. ficifolia* Lam. The latter, however, although resembling *D. brownsbergensis* in its monomorphic trilobate leaves, differs in its brownish indumentum, ovate stipules, more deeply lobed involucre bracts, and much larger stamen number. Perhaps a closer relative of *D. brownsbergensis* is *D. affinis* Muell. Arg., which differs in its unlobed leaves but has similarly tricuspidate bracts.

Evolutionarily, *D. brownsbergensis* is of particular interest in represent-

ing within *Dalechampia* a second and independent origin of the use of aromatic compounds to attract male euglossine bees (Armbruster in prep.). It is not closely related to *D. spathulata* (Scheid.) Baill. (sect. *Cremophyllum*), the only other species now known to have switched from pollination by female bees to attraction of male euglossine bees; in *D. spathulata* the fragrant compounds are produced by modified staminate bractlets homologous with the typical resiniferous bractlets of species such as *D. tiliifolia* (Armbruster and Webster 1979). In contrast, the volatile compounds that attract male euglossines to *D. brownbergensis* are apparently produced by scattered small glands on the involuclers and possibly the pistillate flowers (Armbruster in prep.). The adaptation to male euglossine pollination in *D. brownbergensis* thus represents a striking example of evolutionary convergence in pollination ecology and demonstrates the remarkable evolutionary plasticity of the *Dalechampia* pseudanthium.

ACKNOWLEDGMENTS. We thank the staff of STINASU for their cooperation and assistance and for allowing us to work in the Brownsberg Nature Preserve. Field work was supported by the University Research Expeditions Program (UREP, University of California, Berkeley) and by NSF grant DEB 77-24263. Present address of WSA: Department of Biological Sciences, University of Alaska, Fairbanks, Alaska 99701.

#### LITERATURE CITED

- ARMBRUSTER, W. S. and G. L. WEBSTER. 1979. Pollination of two species of *Dalechampia* (Euphorbiaceae) in Mexico by euglossine bees. *Biotropica* 11:278-283.
- MUELLER, J. 1874. *Dalechampia* in *Flora Brasiliensis* 11(2):633-664.
- PAX, F. and K. HOFFMANN. 1919. Euphorbiaceae—Dalechamptieae. *Das Pflanzenreich* IV.147.XII(Heft 68):1-59.
- SCHULZ, J. P. 1960. Ecological studies on rain forest in northern Suriname. *Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect.* 53:1-267.