DUSSIA ATROPURPUREA (*LEGUMINOSAE–PAPILIONOIDEAE*), A NEW SPECIES FROM CENTRAL AMERICA AND NOTES ON SARCOTESTA COLORATION IN *DUSSIA* SYSTEMATICS

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Dussia atropurpurea is a new species found in Costa Rica and Panamá. It differs from all other *Dussia* species in this region in its dark purple sarcotesta. The only other species of *Dussia* with a sarcotesta of this colour is the Amazonian *D. tessmannii* which is clearly distinct morphologically. Sarcotesta colour is an important character for species delimitation in *Dussia*, but is infrequently recorded.

Keywords. Costa Rica, fruit dispersal, *Leguminosae*, Panamá, sarcotesta.

INTRODUCTION

Dussia Krug & Urb. ex Taub. is a genus of large rain forest trees distributed in South and Central America and the Caribbean. *Dussia* is poorly known, both taxonomically and biologically because its species have been seldom collected because of their relative rarity and large size. This lack of specimens led previous taxonomists studying *Dussia* to be cautious in their conclusions. For example, Rudd (1963), in the most recent monographic revision, stated that her delimitation of taxa was 'of necessity tentative because of inadequate material'. She recognized 10 species, and recent annotations of herbarium sheets suggest that other workers have suspected that there are additional new species.

This paper, describing the new species *Dussia atropurpurea*, arises from a monographic study that has involved considerable field research in Costa Rica, Ecuador and Colombia. These studies have revealed much new data about the fruits of *Dussia*. These are more or less ellipsoidal, 3–14cm long, 1–5-seeded, and dehiscent. The seeds are large (to 5cm long) and covered in a fleshy seed coat (i.e., a sarcotesta rather than an aril; Herendeen, 1995) that comprises three layers: a thin, somewhat lignified layer covering the cotyledons, a white, mealy, sweet-tasting middle layer of a few millimetres thickness, covered by a thin, coloured membrane. This membrane varies in colour in different species from orange, orange-red and red to very dark purple (almost black). Although the variation in colour from orange to red appears

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continuous, we have seen no intermediates between the red-orange and the purple-black colorations, and none are reported on herbarium labels. This discontinuous difference between orange-red and purple-black sarcotestas is of significance in species delimitation, and is the most important character that differentiates *D. atropurpurea* from all other species of *Dussia* in Central America.

Dussia fruits fall into van Roosmalen's (1985, p. xvi) seed-dispersal strategy 1: attractive, bright coloured fruits containing one to few seeds with a relatively dry, fleshy, lipid-rich aril, mesocarp or sarcotesta. Fruits with this seed-dispersal strategy might be berries or drupes (e.g., many *Anacardiaceae*, *Guttiferae*, *Lauraceae*) or thick-walled, dehiscent capsules such as *Dussia,* where the generally dull brown or yellow fruit valves split to reveal the brightly coloured seeds. Van Roosmalen suggested that this class of fruit is eaten by specialist frugivores such as relatively large spider and howler monkeys (*Ateles* and *Alouatta*), kinkajous (*Potos*), coatis (*Nasua*) and relatively large birds that process the aril or mesocarp and regurgitate the seeds (e.g., toucans [*Ramphastidae*], trumpeters [*Psophiidae*], guans and curassows [both *Cracidae*]). Aguilar (herb. label no. 3296) reports Central American spider monkeys (*Ateles geoffroyi*) feeding on fruit of *D. discolor* (which has an orange-red aril), but apart from this, no direct observations have been made of animals feeding on *Dussia* fruits. It is possible that the different sarcotesta colours (orange-red versus purple-black) might have evolved to attract different dispersers.

Unfortunately, few botanists have recorded the sarcotesta colour when collecting fruiting specimens of *Dussia*. Species delimitation in this genus would be more straightforward if more data of sarcotesta colour were available. We would encourage anyone collecting *Dussia* in future to make careful notes of sarcotesta colour, and preferably to take colour photographs.

Dussia atropurpurea N. Zamora, R.T. Penn. & C.H. Stirt., **sp. nov. Figs 1, 2.**
Ab omnibus speciebus Centro-Americanis generis *Dussiae* sarcotesta atropurpurea distinguenda. A *Dussia tessmannii* Harms (alter species in Amazonia cum sarcotesta atropurpurea) foliis multo minoribus (2.5–11cm non 23 70cm longis), foliolis infra indumento pilorum brevium adpressorum (haud indumento longo obtectis), fructibus minoribus (2.8–6 × 1.5 3.8cm cum 1 2 seminibus, non 3.5 12 × 3–5.5cm cum 1 5 seminibus) recedit.

Tree 8–40m tall, 54–70cm diameter, with small buttresses; twigs pale brown, lenticellate and slightly fissured, young twigs glabrous to very sparsely pubescent at the tips, hairs brown. Stipules absent. *Leaves* imparipinnate with 5–9 alternate to weakly opposite leaflets; leaf axis 2.5 11(–28)cm long, glabrous to pubescent with very short, pale, appressed hairs; petiole 2–5(–9)cm long, subcylindrical or somewhat flat at the base; petiolules 3 5(8)mm long; leaflets chartaceous to subcoriaceous, 3.8 9(11.5)cm long × 2.1–5(–6.2)cm wide, ovate, oblong, suborbiculate, obovate or broadly elliptic; apex broadly acute, obtuse, retuse or rounded, occasionally very short acuminate (acumen to 2mm); base acute, cuneate, obtuse to somewhat

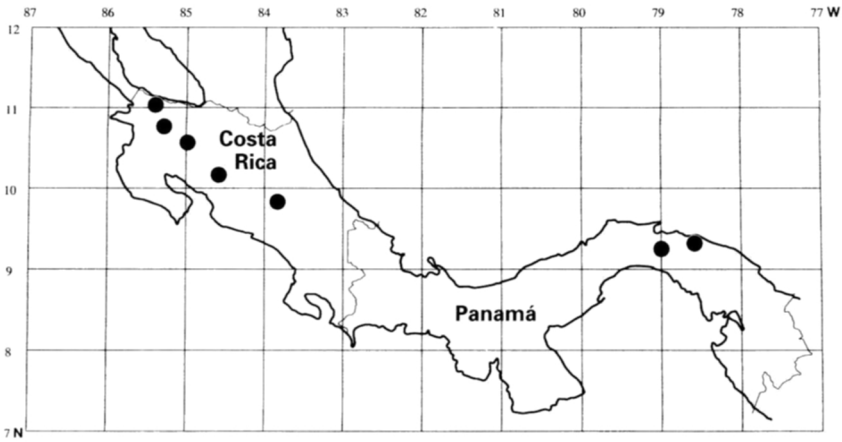

FIG. 1. Distribution of *Dussia atropurpurea* (dots).

rounded, asymmetric; upper surface glabrous or some sparse hairs on primary vein; lower surface glabrous to sparsely pubescent with appressed, pale hairs; primary vein plane above, raised below; secondary veins 8–10 pairs, extending to the margin, raised below; tertiary and quaternary veins faintly visible. *Inflorescence* 7–20cm long, racemose, axillary or terminal, axis light brown, rufous pubescent; bracts 3 × 1.5mm, ovate and reflexed; bracteoles 1–2 × 1mm, ovate-elliptic, at base of calyx. *Flowers* 16–17mm long, white with purple tinge, centre of standard with a green blotch; pedicel 6–7mm long; calyx 6–7mm long, densely more or less appressed rufous pubescent; standard 12 × 10mm, claw 3–5mm long; keel 12 × 5mm, claw 3–5mm long; wing 12 × 3–4mm, claw 2.5–5mm long; stamens 10, fused at base, 14mm long, anthers equal, medifixed; style 7–9mm long; ovary 6–8 × 2–3mm, densely pubescent with pale, ±appressed hairs, ovules 3–4, stigma minute. *Fruit* ellipsoid or orbicular, valves yellow when ripe, 2.8–6 × 1.5–3.8cm, 1–2-seeded, short and densely rufous-pubescent, surface minutely rugose; sarcotesta deep purple to black.
Type: Costa Rica, Guanacaste, Parque Nacional Rincón de la Vieja, sendero de la toma de agua, 3km from the station, 17 ix 1990 (fr), *G. Rivera* 529 (holo. INB, iso. CR, E).

Distribution. Costa Rica and Panamá (Fig. 1). The gap in the distribution in western Panamá might reflect lack of collecting in this zone, especially as *Dussia* species are large trees that occur at low frequency. There are also very few collections of other *Dussia* species from the zone.

Habitat. Lowland rain forest (150–325m in Panamá) and lower montane forest (580–1000m in Costa Rica).

Flowering time. May (Costa Rica); December (Panamá; single record)

Fruiting time. May to October (Costa Rica); August (Panamá).

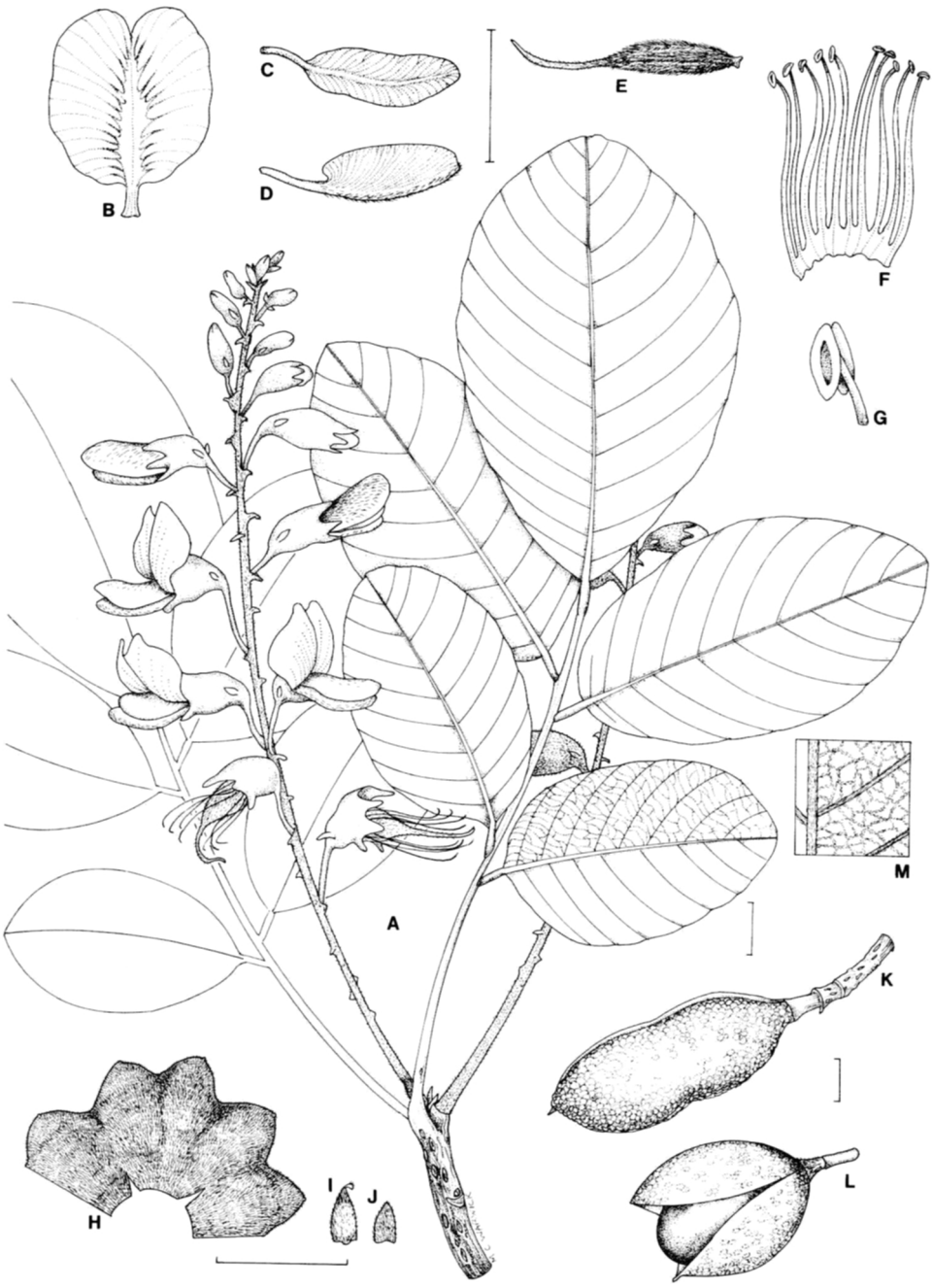

FIG. 2. *Dussia atropurpurea*. A, habit; B, standard petal; C, wing petal; D, keel petal; E, gynoecium; F, androecium; G, anther (×20); H, calyx (opened out); I, bract; J, bracteole; K, 2-seeded fruit before dehiscence; L, single-seeded fruit after dehiscence; M, leaflet undersurface (×2.5). A–J, M from *McPherson 11856*, K from *Rivera 529*, L from *de Nevers 3777*. All scale bars 1cm. Drawn by Maureen Warwick.

Vernacular names and uses. None recorded.

Note: *Dussia atropurpurea* was first discovered by C.S. Stirton during his studies of Neotropical Sophoreae. He noted its small leaves with few leaflets, and small fruits. These characters (Table 1) are differential rather than diagnostic, however, because there is overlap with some individuals of *D. discolor* (Benth.) Amsh. from Costa Rica (e.g., *D. Smith* 233; *R.T. Pennington et al.* 609, 611, 621; *L.D. Gomez et al.* 21080; *R. Espinoza* 1465; in Table 1 and the description of the leaves of *D. atropurpurea*, the larger bracketed measurements are all from a single specimen [*Lent* 2546], where the leaves are not from flowering and fruiting twigs, and might be larger shade leaves from the lower canopy). There also appears to be ecological differentiation in Costa Rica because *D. atropurpurea* grows at higher altitudes (580–1000m) than *D. discolor*. Subsequently, we discovered the diagnostic character of the purple-black sarcotesta; *D. discolor* has an orange-red sarcotesta. The only other species of *Dussia* that has a purple-black sarcotesta is *D. tessmannii*, which is found in Amazonian Ecuador, Peru and Brazil. It is easy to distinguish from *D. atropurpurea* by its larger leaves, long, raised indumentum on the leaflet under-surfaces, larger flowers and larger fruit.

Some reviewers of this paper suggested that the critical character of sarcotesta colour might simply be a populational polymorphism, and not of significance for species delimitation. We argue this is not the case for two reasons. First, where fresh fruit were compared side-by-side in the field there was no evidence for such colour polymorphism in fruiting populations of various species: *D. tessmannii* Harms (purple-black sarcotesta; Jatun Sacha, Ecuador, 01°04′S, 77°36′W; six trees); *D. discolor* (Benth.) Amsh. (orange-red sarcotesta; Rio Palenque, Ecuador, 00°35′S, 79°20′W; three trees); *D. lehmannii* Harms (orange-red sarcotesta; Pedro Vicente Maldonado, Ecuador, 00°05′N, 79°05′W; two trees); and *Dussia macroprophyllata* Harms (La Selva, Costa Rica, 10°26′N, 84°01′W; three trees). Although few trees were observed in each population, sarcotesta colour was completely constant; moreover, notes from herbarium specimens of different collections of the same species made previously in these localities also indicate constancy of sarcotesta colour.

TABLE 1. Differential characters of *Dussia atropurpurea* and *D. discolor*. Measurements for *D. discolor* were taken from c.100 specimens from across its entire range (Central America, the lesser Antilles and northern South America)

Character	*D. atropurpurea*	*D. discolor*
Leaf axis length	2.5–11(28)cm	10–38(–72)cm
Number of leaflets	5 9	(3–)4–12(–14)
Leaflet size	3.8–9(11.5)cm long	(4)5.5–25cm long
	2.1–5(–6.2)cm wide	(2–)2.5 10(11)cm wide
Flower length	16 17mm	15–25mm

Second, there are differential vegetative and flower size characters that correlate with the sarcotesta colour character as indicated in Table 1.

Other specimens examined: COSTA RICA. Cartago: Taus, pastures beside Río Pejibaje between Río Taus & Quebrada Azul, 760m, 28 v 1972 (fr), *Lent* 2546 (CR, F, MO); Guanacaste: La Cruz, Cordillera de Guanacaste, P. N. Guanacaste, Santa Cecilia, Finca La Pazmompa, 4.5km de Santa Cecilia, 11°02′00″N, 85°24′30″W, 700m, 9 x 1990 (fr.), *Moraga* 127 (CR, INB); Liberia, Cordillera de Guanacaste, P. N. Rincón de la Vieja, Sendero de la toma de agua, a 3km de la estación, 10°46′05″N, 85°17′40″W, 1000m, 17 ix 1990 (fr), *Rivera* 529 (CR, INB); Tilarán, Cordillera de Tilarán, Z.P. Tenorio, Tierras Morenas, Finca El Sábalo, 10°34′50″N, 84°59′30″W, 685m, 10 viii 1993 (fr), *Rodriguez et al.* 184 (INB); Alajuela: San Ramón, Reserva Forestal de San Ramón, Colonia Palmareña, 800 950m, 23 v 1986 (bds), *Gómez-Laurito* 11162 (CR).

PANAMÁ. Panamá: Along El Llano-Carti road, along short side-road to west, 15 xii 1987 (fl), *McPherson* 11856 (E, K(2 sheets)); San Blas: El Llano-Carti Road, 19.1km from Interamerican Highway. Continental divide trail E of camp, 28 viii 1984(fr), *de Nevers* 3777 (K).

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