Taxonomic Notes on Bornean *Cryptocarya* R.Br. (Lauraceae)

F.S.P. NG

Forest Research Institute Malaysia
52109 Kepong, Selangor, Malaysia

Abstract

Cryptocarya is sharply defined from other genera in the Lauraceae by floral morphology and fruit development. The ovary is superior and seated within a deep and distinct hypanthium. The developing fruit remains free from the hypanthium but is completely enclosed by it. The resulting inferior fruit has two walls - an outer wall developed from the hypanthium, and an inner wall derived from the ovary wall. The only other tree genera of Lauraceae in SE Asia with inferior fruits are *Eusideroxylon* and *Potoxylon,* but in these two genera, the ovaries are semi-inferior and the pericarp develops from the 'fusion' of the receptacle and the ovary wall resulting in a single fruit wall.
In Borneo, 15 species of *Cryptocarya* are recognized. Seven species are reduced to synonymy.

Introduction

Cryptocarya is a genus of monoecious trees with leaves alternate or spiral, mostly penniveined but in a few species triveined at the base. The inflorescences are paniculate with first, second, third or, rarely, fourth order branching, are terminal and axillary, and irregularly bracteate (sometimes with a bract subtending every flower, sometimes not). The flowers are bisexual, occupying terminal and lateral positions on the panicles, small in all species (2–3 mm long and 1–2 mm wide in dried specimens), bearing 6 perianth lobes (three outer and three inner), a ring of 6 stamens alternating with 6 glands, and an inner ring of 3 stamens alternating with 3 staminodes, at the rim of a distinct and deep hypanthium (Fig. l.Aa). The anthers are 2-locular. The ovary is completely surrounded by the wall of the hypanthium but is free from it, and it remains free throughout the development of the fruit (Fig. l.Ab).

As the fruit develops, the perianth lobes, anthers and staminodes absciss and the hypanthium wall becomes the outer fruit wall. This wall is zoned into a thin skin, a fleshy middle layer and a hard inner layer. Within this, the seed develops within the pericarp, which is dry at maturity. The fruit of *Cryptocarya,* based on the character of the hypanthium wall, can be considered as drupaceous.

Two other tree genera of Lauraceae in Borneo, *Eusideroxylon* and *Potoxylon,* also have drupaceous inferior fruits. Kostermans (1957) described the fruit development of *Eusideroxylon* as follows: "In *Eusideroxylon* the flower tube is shallow, although it completely envelopes the mature fruit". Later, in describing the new genus *Potoxylon,* Kostermans (1978) wrote: "Ovary base immersed in the perianth tube and adnate with it...". Kostermans' comments are based on the definition of the inferior fruit being the result of 'fusion' or 'adnation' of the ovary with a flower tube or perianth tube.

There is no structure in *Eusideroxylon* and *Potoxylon* comparable with the hypanthium of *Cryptocarya.* What we actually see in the flower of *Eusideroxlon* and *Potoxylon* is a semi-inferior ovary, in which about half of the ovule is embedded in the receptacle and half is above it (Fig. l.Ba, Ca). The fruit is the result of massive enlargement of the receptacle and ovary wall resulting in the perianth lobes, stamens and staminodes persisting as vestiges at the apex of the fruit (Fig. l.Bb, Cb, Cc). The fruit is a drupe, with its pericarp zoned into a skin-like epicarp, fleshy mesocarp and hard endocarp. The fruits of *Eusideroxylon* and *Potoxylon* are similar in their morphology but differ from the drupaceous fruit of *Cryptocarya* in the receptacle and ovary wall being 'fused' to form the pericarp (Fig. l.Bb, Cb, Cc), whereas in the fruit of *Cryptocarya* the hypanthium wall remains free from the pericarp (Fig. l.Ab).

There are 15 species of *Cryptocarya* in Borneo, of which the most common and variable one is *C. ferrea.*

Taxonomic Changes

1. Cryptocarya ferrea Blume
Bijdr. Fl. Ned. Ind. (1826) 557. **Type:** *Blume 1559,* Java (holotype L).

This species is probably the commonest and most widely distributed in the genus. It occurs throughout SE Asia and is highly variable in leaf size, leaf shape and angle of inclination of the lateral veins. In this treatment, three varieties, var. *erectinervia,* var. *ferrea* and var. *scortechinii,* are recognised in Borneo, into which most specimens can be placed but many specimens are intermediate and their placement only approximate.

Var. **erectinervia** (Kosterm.) Ng, **stat. nov.**
Basionym: *C. erectinervia* Kosterm., Reinwardtia 7 (1968) 307. **Type:** *Kostermans 9908,* Kalimantan, Samarinda (holo L; iso BO, KEP, SAN).
This variety is characterized by lateral veins acutely inclined and almost

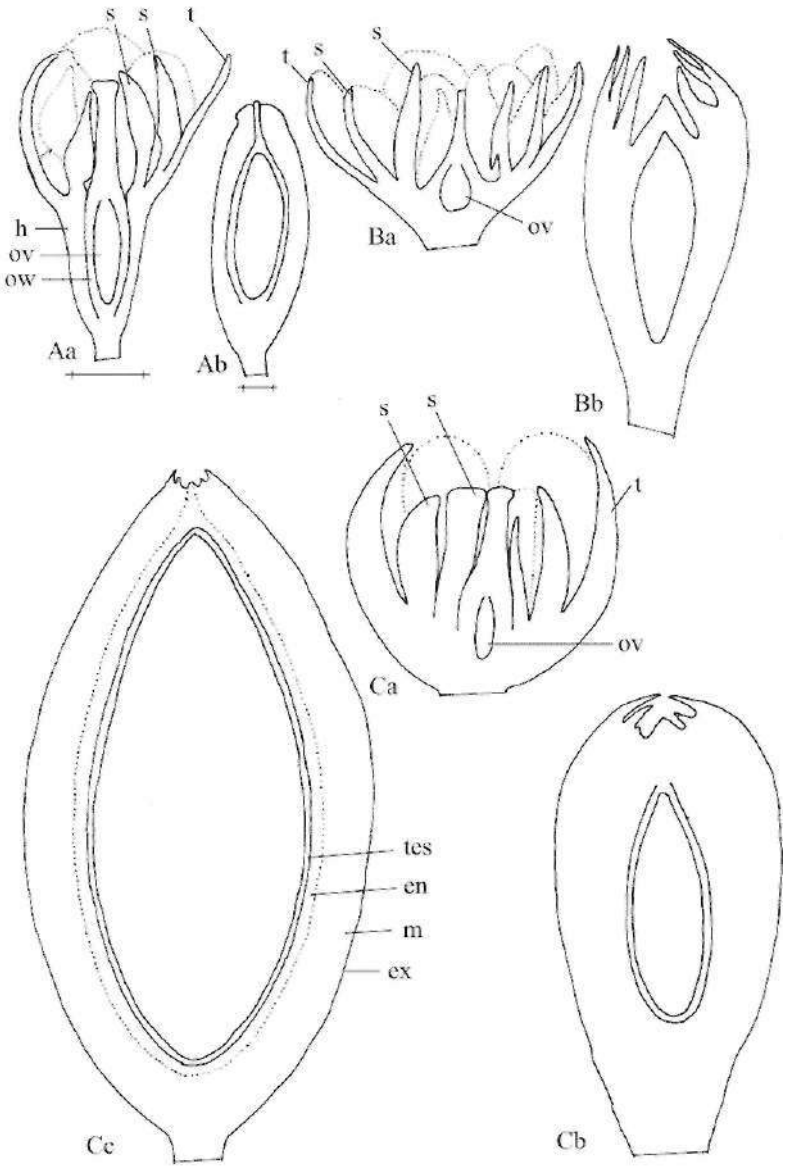

Figure 1. Longitudinal sections of the flowers and fruits of *Cryptocarya, Eusideroxylon* and *Potoxylon*

Aa. flower of *Cryptocarya ferrea* var. *ferrea (KMS 3299);* Ab. young fruit of *Cryptocarya ferrea* var. *erectinervia (SAN 92730);* Ba. flower of *Potoxylon melagangai (S 57892);* Bb. young fruit of *P. melagangai (SAN 73320);* Ca. flower of *Eusideroxylon zwageri (KEP 98302);* Cb and Cc: young and mature fruits of *E. zwageri (FSP Ng s.n.,* 14 May 05, freshly fallen, in FRIM plantations.

ov ovule; ow ovary wall; h hypanthium; t tepal; s stamen or staminode; tes testa; en endocarp; m mesocarp; ex exocarp. Scale indicates 1 mm.

straight until they approach the leaf margin; the leaf blades are longer than 15 cm and oblong in shape.

Distribution: Peninsular Malaysia and Borneo. In Borneo: Sabah - Kota Kinabalu, Keningau, Ranau, Sipitang, Tawau (e.g. *SAN 16485, SAN 16761, SAN 38503* and *SAN 90730);* Sarawak - Sungai Jelalong, Kakus, Mt. Mersing, Tubau (e.g. *S 4947, S 21828, S 22490* and *S 48984);* Kalimantan - E. Kutei and Samarinda (e.g. *Kostermans 5566, 5908, 9931, 9908).*

Var. **scortechinii** (Gamble) Ng, **stat. nov.**
Basionym: *C. scortechinii* Gamble, Bull. Misc. Inform. Kew (1910) 143. **Type:** *King's Collector 6297* (lectotype L = *Sheet No. 003624880761,* here designated).

This variety is characterized by leaves broadly oblong or broadly elliptic, with lateral veins distantly spaced.

Distribution: Peninsular Malaysia and Borneo. In Borneo: Sabah - Lamag, Mostyn, Pulau Sapanggar (e.g. *SAN 23858, SAN 35293* and *SAN 57269);* Sarawak - Belaga, Lambir, Lubok Antu, Selampit, Semengoh (e.g. *S 24109, S 26987, S 44076* and *S 69647);* Brunei - Andulau, Belait, Bukit Puan (e.g. *Wong WKM 950, BRUN 578* and *BRUN 2635).*

Var. **ferrea**
New synonyms:

C. tomentosa Blume, Mus. Bot. Lugd. Bat. 1 (1851) 335. **Type:** *Blume s.n.,* Java (holo L = *Sheet No. 8983353).*

C. kurzii Hook. /., Fl. Brit. Ind. 5 (1886) 119. **Type:** *Griffith 1142 (= Kew Distr. 4274),* Burma, Mergui (holo K).

C. bicolor Merr., Phil. J. Bot. 4 (1909) 255. **Type:** *Hutchinson For. Bur. 6548,* Philippines, Mindanao (holo not seen; iso SING).

C. argentea Gamble, Bull. Misc. Inform. Kew (1910) 144; *C. kurzii* Hook./. var. *argentea* (Gamble) Airy Shaw, Bull. Misc. Inform. Kew (1939) 535. **Type:** *King's Collector 7966,* Perak (holo K; iso SING).

C. tawaensis Merr., Plantae Elmerianae Borneenses. (1929) 89. **Type:** *Elmer 21418,* Sabah, Tawao (holo not seen; iso L, U). (Elmer spelled Tawau as 'Tawao' on the collecting label).

C. kurzii Hook. /. var. *subsericea* Airy Shaw, Bull. Misc. Inform. Kew (1939) 535. **Type:** *Richards 2443* Sarawak, Gunung Balapau (holo K; iso SING).

C. borneensis Kosterm., Reinwardtia 7 (1968) 302. **Type:** *Wood SAN 16257,* Sabah, Sipitang (holo L).

This variety is characterized by leaves narrowly elliptic, ovate or obovate, with lateral veins closely spaced.

Distribution: Myanmar, Peninsular Malaysia, Borneo, the Philippines, Java and Sulawesi; probably throughout SE Asia. In Borneo, common throughout Sabah (e.g. *SAN 27336, SAN 46277* and *SAN 76444);* Sarawak at Bako, Batang Tinjau, Belaga, Sungai Temulan and Tubau (e.g. *S 39990, S 41010* and *SFN 35720);* Brunei at Andulau Forest Reserve (e.g. *BRUN 16914);* Kalimantan at Balikpapan, Gunung Bentuang, Nunukan, Samarinda, Sankulirang (e.g. *Kostermans 5953, Kostermans 8937* and *Kostermans 9946).*

2. Cryptocarya griffithiana Wight
Icon. 5 (1852) 12, t. 1830. **Type:** *Griffith s.n.,* Malacca (not located).

A widespread species ranging from Myanmar to Sumatra, Peninsular Malaysia, Borneo and the Philippines. Two varieties are recognised, differing consistently only in the length of the bracts that subtend the flowers.

Var. **crassinervia** (Miq.) Ng, **stat. nov.**
Basionym: *Cryptocarya crassinervia* Miq., Fl. Ind. Bat. 1, 1 (1858) 924. **Type:** *Teijsmann s.n.,* Sumatra, Fort de Kock (holo L = *Sheet No. 905229445).*

This differs from the typical variety in the floral bracts shorter than the flowers they subtend.

Distribution: Sumatra, Peninsular Malaysia, Borneo and the Philippines. In Borneo: Sabah - Beaufort, Kalabakan, Kota Belud, Sandakan, Semporna, Sipitang, Tawau, (e.g. *SAN 86242, SAN 88178, SAN 102650* and *SAN 121972);* Sarawak - Belaga, Kuching, Limbang (Gunung Pagon), Kelabit Highlands, Lambir, Lundu (Bukit Berumput), Simunjan (e.g. *Haviland & Hose 3295, S 38465, S 46345* and *S 70823);* Brunei - Bukit Apoi and Belait (e.g., *Coode 7921, Forman 866* and *Wong WKM 1281)* and Kalimantan - Tumbang Tapi and Bukit Raya (e.g. *Veldkamp 8252* and *Veldkamp 8549).*

Var. **griffithiana**
The typical variety has floral bracts longer than the flowers they subtend. It is rare or possibly extinct in Borneo, being known only by one specimen, *Haviland 870,* from Lundu, Sarawak. The type specimen of this variety could not be found at Kew, but this taxon is well-known in the Malay

Peninsula and there is no doubt about its identity.

3. Cryptocarya wrayi Gamble
Bull. Misc. Inform. Kew (1910) 142. **Type**: *Wray 3853,* Peninsular Malaysia, Gunung Bubu, (holotype K).
New **synonym:** *C. tuanku-bujangii* Kosterm., Reinwardtia 8 (1970) 79. **Type:** *Paie S 26404,* Sarawak, Lawas, path to Gunung Murut (second summit). (holo SAR; iso L, SING).
This is a small tree to 4 m tall, on the summits of mountains. The plants in the Malay Peninsula named *Cryptocarya wrayi* and those in Borneo named C. *tuanku-bujangii* both occupy mountain summits and both have triveined, ovate, coriaceous leaves. I think they are at most only minor geographic variants of the same species.

Distribution: Peninsular Malaysia and Borneo. In Borneo: Brunei - Gunung Pagon Periok (e.g. *Ashton BRUN 2388)* and Sarawak - Batu Lawi, Gunung Murud and Gunung Mulu, (e.g. *S 26404, S 38839* and *S 50869).*

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