Taxonomy and uses of *Daemonorops draco* (Willd.) Blume

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ABSTRACT

Dragon's blood group or locally known as rotan jernang distribute from Malay Peninsula, Sumatra, Borneo to Java. Ten species are recognized formerly but only *Daemonorops draco* (Willd.) Blume is very well known worldwide and widespread in Sumatra. Sometimes botanist regarded this species to other related species. Red resin on its fruit scales have been used by Anak Dalam and Talang Mamak tribes from Bukit Tiga Puluh National Park as dying or furnishing. Unfortunately, taxonomic status of this species is doubtful because of the fact that more than a century there is no clear type addressed to this species. New type of *Daemonorops draco* (Willd.) Blume is designated here together with the distribution and ecology, and economic botany information.

INTRODUCTION

Rattans are climbing old world members of the palm family, Palmae or Arecaceae (Uhl and Dransfield, 1987). There are about 600 different rattan species arranged in 13 genera. They share a unique characteristic in the presence of overlapping reflexed scales on their fruits. The principal method of climbing is associated with the presence of groups of reflexed grapnel-like spines. *Daemonorops* as one of these rattan genera derived from the Greek word *daemon* (devil) and *rhops* (shrubs) (Beccari, 1911)

History of *Daemonorops*

Daemonorops with almost 115 species is the second largest rattan genus after Calamus. It belongs to the subtribe *Calaminae,* tribe *Calameae* of the palm subfamily *Calamoideae.* Beccari (1911) divided Daemonorops into two sections b*ased on the structure of the inflorescence,* i.e. section *Cymbospatha (*correctly *Daemonorops*) and section *Piptospatha.* Basically the former have concave boat-shaped bracts which are at anthesis completely enclosed by the prophyll (the first bract) and splitting longitudinally to expose the flowers. In contrast, the bracts of the species in the latter section split to the base and only the lower part is enclosed by the prophyll. According to Furtado (1953) the bracts of section *Piptospatha* usually fall at anthesis and occasionally only the prophyll remains.

Within section *Piptospatha* there is a unique group known as dragon's blood group consisting of ten species that produce red resin on their fruit scales (Beccari, 1911; Furtado, 1935, 1953; Burret, 1942; Dransfield, 1979, 1982, 1992; Rustiami, 1999, 2002a, 2002b). Three species, *Daemonorops didymophylla* Becc, *Daemonorops micracantha* Becc. and *Daemonorops maculata* J. Dransf., occur in Borneo., one species *Daemonorops rubra* Blume in Java, especially at the Gunung Gede-Pangrango National Park and Gunung Halimun National Park the remaining species are found in Sumatra.

Taxonomy of Daemonorops

Key to the species of dragon's blood group of *Daemonorops* section *Piptospatha*

1. Petiole absent .....1. *D. maculata*
   Petiole present 2

2. Leaflets in pairs .....2. *D. didymophylla*
   Leaflets not as above 3

3. Spines on the leaf sheath bulbous, at the base, easily detached .....3. *D. micracantha*
   Spines on the leaf sheath not bulbous scattered, not easily detached.....4

4. Leaf to 5 cm wide, spines absent on both leaf surfaces .....4. *D. brachystachys*
   Leaf less than 5 cm wide, spines present on upper surface, lower surface or both surfaces.....5

5. Transverse veinlets present, conspicuous .....5. *D. draco*
   Transverse veinlets absent 6

6. Spines present on mid vein of lower surface .....6.*D. rubra*
   Spines present on all vein of upper and lower surface 7

7. Spines present on the leaf sheath mouth to 7 cm long .....8. *D. siberutensis*
   Spines absent on the leaf sheath mouth a.....8

8. Leaflets regularly arranged 9
   Leaflets irregularly arranged .....9. *D. dracuncula*

9. Fruits rounded, seed surface reticulate .....10. *D. acehensis*
   Fruits broadly oblong, seed surface smooth ..... 11. *D. dransfieldii*

Daemonorops draco (Willd.) BLUME

Daemonorops draco (Willd.) Blume, Rumphia 2:8, pl. 132. 1838; Mart. Hist. Nat. Palm. (1838) 3:205; Miq. Fl. Ind. Bat. 3:95. – *Calamus draco* Willd. Sp. Pl. (1799) 2:203; Mart. Hist. Nat. Palm. (1838) 3:211; Roxburgh Fl. Ind. 3:774. – *Palmijuncus draco* Rumphius *in* Kuntze Revis. Gen . Pl. (1891) 2:732. Type: South Sumatra: Bukit Kelam, Curup, 13 February 1971, *John Dransfield* 1241, fruit (neotype BO, here designated)

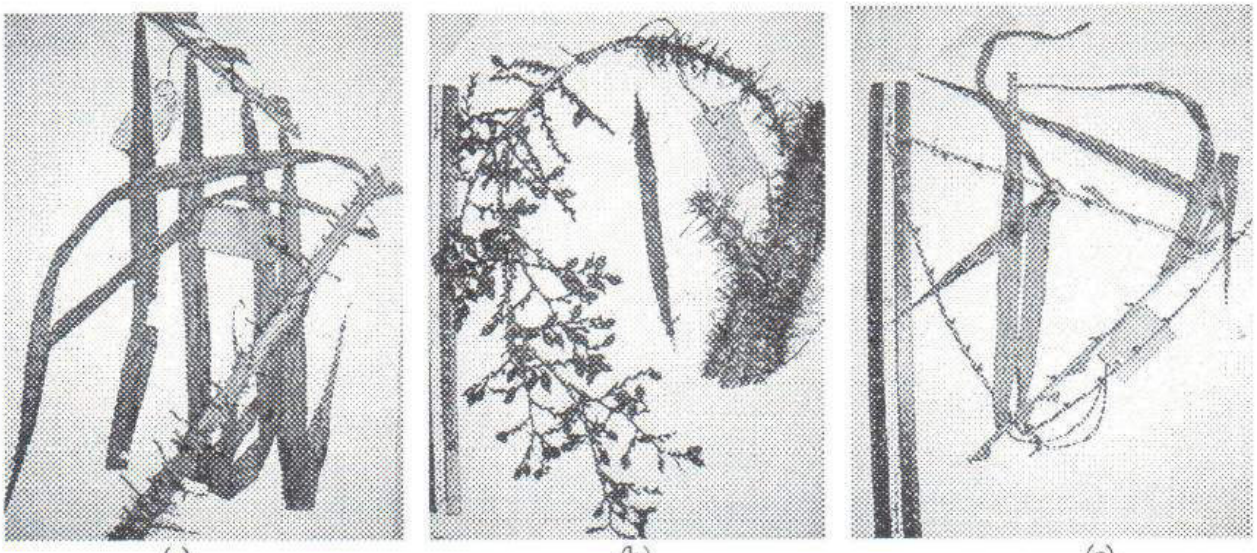
Daemonorops propinqua Becc., JD Hook., Fl. Brit. Ind. (1893) 6: 467 and Ann. Roy. Bot.Gard. Calc. (1911) 12:11; Ridley Fl. Mal. Pen. (1925) 5:41; Furtado Gard. Bull. Sing. (1953) 14:108; Dransfield Man.Ratt. Malay. Pen.(1979)94. Type : Malay Peninsula, Perak, loc. Incert. *Scortechinii*, sn (lectotype Herb. Becc.). **synon. nov.**

Clustering rattan, climbing to 8 m; stem without sheaths 8-14 mm in diam., with sheaths up to 30 mm, internodes to 20 cm long; leaf sheaths brownish armed by densely horizontal-triangular spines, flattened, in irregular length, 5 – 45 mm long, abundantly covered by blackish brown indumentum, very conspicuous, numerous, easily fall off; leaf sheath mouth unarmed; knee present, conspicuously, armed as the rest of leaf sheath. Leaf to 3 m long. cirrus to 100 cm long; petiole to 10 cm long, adaxially yellow, armed with group of spines, scattered; leaf rachis armed as the rest of leaf sheath, especially on the cirrus armed with regularly arranged groups of grapnel-like spines; leaflets irregularly arranged at upper half, regularly arranged below, up to 20 on each side, leaflets linear lanceolate, leathery, terminate in a acute point, and at the margin blackish bristly, equidistant, slightly conspicuous, midribs prominent abaxially, longitudinally plicate. Leaflets to 37 cm long, to 4 cm wide. Inflorescence pendulous, to 51 cm long, peduncle 9 cm long, armed along the margin with short spines; female prophyll deciduous, leathery, armed with very rare group of spines, 16 cm long by 1.5 cm wide, ellipsoid oblong, bearing up to 6 partial inflorescence (rachilla), each rachilla up to 10 cm long, consist of up to 9 rachillae each; involucre short, 5 mm long by 6 mm wide, flat, papery, just above the involucrophore; involucrophore short, 6 mm long by 9 mm wide, papery, angular; male prophyll deciduous, leathery, armed with group of spines, scattered in irregular distant, 16 cm long by 2.5 cm wide, ellipsoid oblong, bearing 3 partial inflorescence (rachilla), each rachilla up to 10 cm long, consist of up to

10 rachillae each; involucre short, 5 mm long by 6 mm wide, flat, papery, just above the involucrophore; involucrophore short, 6 mm long by 9 mm wide, papery, angular. Female and male flowers unknown. Infructescence covered by ferruginous detachable indumentum. *Fruit* covered by 10 scales arrange in vertical rows, broad, 1.3 x 1.3 cm, dark reddish line in the middle of scales, scattered with dragon's blood. Seed ovate oblong, c. 1 x 0,7 cm, reticulate on half surface and the other half deep rugose surface.

Specimens Examined

Sumatra – Jambi, Pasir Mayang, PT IFA Concession, 15/02/82, MJ Vreeken-Buijs: MJVB 96 (L); North Sumatra, Sibolangit, 26/09/27, Lorzing: Lorzing, 12490, fruit (BO, L); Asahan, Dolok Maradja, 06/10/28, Rahmat Si Toeroes: RST 1473, fruit (BO, L); Asahan, Silo Maradja, Bartlett: Bartlett 6433, female flower (K, BO); Asahan, Bandar Puluh, HS Yates: HS Yates 1906, fruit (K, BO); Aek Sordang, Loendoet Concession, Koealoe, 17/05/27, Bartlett: Bartlett 6957, fruit (L); Asahan, 18/10/33, Rahmat Si Boea: RSB 5824 (L); PW. Korthals: Korthals; Palembang, 1831, Praetorius: No. 2; Sungei Buloh Reserve, FG. Omar: FG Omar 9916, fruit (K, BO); South Sumatra, Bukit Kelam, Curup, 13/02/71, John Dransfield, JD 1240, male flower (BO); Lampung, Mt Tanggamus, 5° 26' S, 104° 41' E, M Jacobs 8170, fruit (BO); West Sumatra, Mentawai archipelago, Siberut island, 14/9/24, Iboet 123, fruit (BO, L); Padang, Lubuk Selasi, Bukit Barisan at Air Sirah, 05/03/74, John Dransfield & JP Mogea, JD 4023, female flower (BO); Riau, Bukit Tigapuluh National Park, Talang Lakat Village, Seberida District, Indragiri Hulu Regency, 09/08/2000, Joko R Witono, JW 147, fruit (K, BO); Riau, Bukit Tigapuluh National Park, Talang Lakat Village, Seberida District, Indragiri Hulu Regency, 10/08/2000, Joko R Witono, JW 149 (K, BO).



(a) (b) (c)

Figure 1. (a). Leaves and petiole of *Daemonorops draco* (b). Inflorescences of *Daemonorops draco* (c). Cirrus of *Daemonorops draco*.

Taxonomy and typification

The vernacular name of this species is generally known in Sumatra as *rotan jernang* and *rotan kelukup* in Riau. The local name *rotan jernang* is always identical with *Daemonorops draco* (Willd.) Blume, which was first mentioned by Willdenouw in 1753. Unfortunately *Daemonorops draco* Blume is a name of uncertain application, because there is no type specimen of this name. Actually, the basionym of *D. draco* is *C. draco* described by Willdenouw based on *Palmijuncus draco* of Rumphius. Beccari (1911), Furtado (1953) and Dransfield (1979) have attempted to account for old names such as *C. draco.* However, the truth of the matter is that we could choose any dragon's blood species as being *P. draco* of Rumphius, because it is impossible to say what sort of rattan Rumphius was referring to. Description of *Daemonorops draco* by Martius was also based on Willdenouw, so we can not use *Daemonorops draco* sensu Mart. Blume in 1837 made a very comprehensive description of *Daemonorops draco.* Unfortunately some of his description was based on more than one species which are also bearing dragon's blood fruits (Beccari, 1911). For example, he describes fruit characters, but they lead us to the fruit of *Daemonorops rubra* Blume, which is also related to dragon's blood group. *Daemonorops draco* (Willd.) Blume from Palembang, Sumatra does not have an unambiguous type specimen; hence this species should be categorized as an imperfectly known species. In view of the above facts a new type specimen was selected for species of dragon's blood group that fits characteristics of *Daemonorops draco* (Willd.) Blume.

The protologue for *D draco* was based on Rumphius collection but neither this type specimen nor any illustration drawn from type specimens based upon it can be traced and so a neotype is proposed here. Willdenouw (1753) gave his description but it is very unclear, hence it is not suitable to designate it as a protologue type.

Morphology

The *stems* of members of the Dragon's blood group of *Daemonorops* (as with other rattans) are covered tightly by densely spiny leaf sheaths. The diameter of the stem including the leaf sheaths may vary from a few mm to over 10 cm.

A *leave* consists of a tubular base wrapped by a leaf sheath, which arises from the node on the stem; at its upper end, the sheath narrows into the petiole that continues into the rachis or leaflet-bearing portion of the leaf. Although a petiole is usually present, it is sometimes very short or absent, as in *D. maculata.* In many species the rachis is extended beyond the terminal leaflets into a barbed whip (cirrus), which acts as a climbing organ (Dransfield and Manokaran, 1994). Spine arrangement on the leaf sheath is remarkably diverse and frequently of diagnostic importance. Just below the petiole or leaf rachis, there is a marked swelling known as **the knee**. This character is

also of some diagnostic importance, because some of the *Daemonorops* species do not have very obvious knees or the knee is only slightly developed.

Flowers of most rattans are dioecious (including all *Daemonorops* spp), where female and male flowers are borne on different plants. The basic branching pattern of inflorescences of *Daemonorops* is similar. The main axis bears a basal bract or prophyll which may be short and tubular, or large. Branches are borne in the axils of subsequent bracts. The branches in turn bear bracts, the lowermost of which is usually empty, subsequent bracts subtending branches, and so on. The ultimate flower-bearing branches are termed rachillae. In the female inflorescence, flowers are borne in dyads consisting of a fertile female flower and a sterile male flower, while in the male flower the flowers are borne singly. Each male flower is accompanied by a prophyllar bracteole referred to as an involucre. In the dyad, there are two bracteoles, the involucre and the involucrophore.

Photo by Harry Wiriadinata

Figure 2. Habit of *Daemonorops draco*

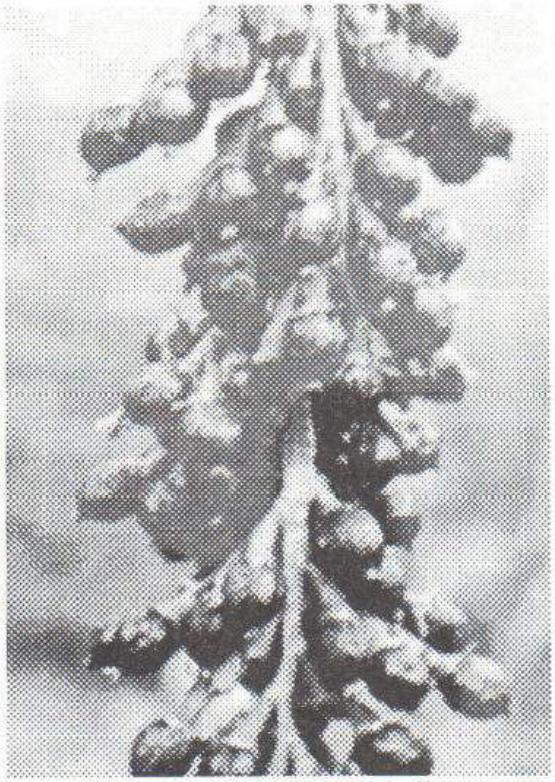


Photo by Harry Wiriadinata

Figure 3. Close up part of infructescences

DISTRIBUTION AND ECOLOGY

Dragon's blood species are confined to Malaysia, Thailand and West Indonesia. Since their distribution seems only limited to part of western Southeast Asia, they are said to be endemic to that region. They are a natural unit but taxa within the unit have

diverged because of isolation or adaptation. As long as the isolation persists, each species will tend to become slightly different from the others. Secondly, their confinement might be due to the fact that they have only recently evolved and have not yet had time to spread from their centers of origin.

In the case of *Daemonorops draco* its distribution is restricted to Sumatra, i.e., West Sumatra, South Sumatra, Jambi, Riau and Lampung. (Figure 4) This geographical isolation can lead to an allopatric speciation, where population is segregated by a geographical barrier. This species can be found in hill slope and valley bottom on lower montane primary forest up to 1000 m alt.

UTILIZATION OF DAEMONOROPS

Local people, particularly, have long known the uses of rattans including *Daemonorops*. These spiny climbers have long been used in the making of baskets, cords, furniture and also fruits of some species as reported by Dransfield (1991) have been used for medicinal purposes and as dye. The most important produce of *Daemonorops* section *Piptospatha* is red resin or dragon's blood, which in Malays and Indonesian word is known as *jernang*. At one time the red resin 'dragon's blood' from the fruits of some species was an item of trade between Borneo, Sumatra and the Malay Peninsula and China (Uhl and Dransfield, 1987). The shoots of some *Daemonorops* species, such as *D. periacanthus*, can be eaten as they have sweet taste. Besides the involucre of the seed in some species is leathery, but has refreshing acid and sweet taste. Related species which also produce the red resin known from Sumatra are *D. acehensis, D. brachystachys, D. dracuncula, D. dransfieldii* and *D. siberutensis*. Only *D. draco*, however, is collected and traded by both the Talang Mamak dan the Kubu tribes.

Rotan jernang has been used as a dye, for coloring varnishes and lacquers, plasters, tinctures, tooth paste, imitation tortoise shell and marble and has also a medicinal reputation against a variety of diseases, such as syphilis and cancer and is made use of as a tonic, anti rheumatic, emetic, analgesic, diuretic and a sedative (Schumaker 1993). The collector's price of the resin powder was about Rp. 30.000 (about US$3) per kg (Schumaker, 1993) and recently the price of good quality one has gone up to about Rp. 650.000 (about US$70) per kg (Mogea, 2005, pers. com.); it is exported to China. It provides an important source of extra income for some households of local communities.

The *rotan jernang* has been long used by some indigenous tribes in Sumatra; we observed that it is particularly used within the area of Bukit Tiga Puluh National Park (BTPNP) in the border of Riau and Jambi Province (Figure 4). In this area the Talang Mamak and Anak Dalam or Kubu tribes have used *rotan jernang* a great deal. The Talang Mamak and Anak Dalam tribes are semi-nomadic, most of the time moving within the Park and its surrounding area, but occasionally settle for a brief period to practice simple cultivation. Both tribes are mainly dependent on forest resources for their livelihood.

The word Mamak of the Talang Mamak. It is believed that the oldest Mamak of this tribe is a descendant of Datuk Perpatih Nan Sabatang who a long time ago opened a new area for a village, which later on is named as Talang. The people of Talang are then known as the Talang Mamak (Melalatoa, 1995). Their main livelihood is shifting cultivation of dryland rice with traditional method also in addition to planting cassava, corn and peanuts. They also look for non timber forest product such as sap of rubber plant (*Hevea brasiliensis*) that become wild cane of *Daemonorops draco* and honey produced by bees foraging on flowers of certain trees, such as *jelutung* (*Dyera costulata*), *pulai* (*Alstonia scholaris*) *Keruing* (*Dipterocarpus* spp.), *kempas* (*Koompassia malaccensis*) and *kayu kundur* (*Xeropsermum* spp.)

The Anak Dalam tribe is also known as the Kubu tribe. The word Kubu means defence in Kubu language and has been used to name the Anak Dalam tribe, because they seem to perpetually defend themselves against the harassment other communities. However, they do not like this special term because they consider it as a humiliation. They prefer to call themselves as Anak Dalam tribe or Orang Rimba because they live in the forest. The Anak Dalam tribe is nomadic, and will stay in certain places only for a short period ranging from two days to not more than one week if there main food (*Banar*, *Dioscorea* spp.) are available in the surrounding areas (Setyowati, 1999). They earn their main livelihood, however from collecting non timber forest products, such as sap of *Palaquium* spp., *Dyera costulata*, and *Hevea brasiliensis*, cane of *Calamus ciliaris* and *Calamus manan* as well as resin of *Daemonorops draco*.

How to make dye and furnish from rotan jernang

The collected fruits are dried under the sun. Dried fruits are placed in a basket, pounded with a piece of wood and shaken. The friction resulted from this treatment detaches the resin, which falls through the basket into a piece of cloth placed below, as a gritty powder. This powder is further pounded to make it into dust which is then mixed with hot water in a plastic bag and later molded into cakes or sticks. After extraction of resin the seeds are thrown away and let them to grow in places where local people make dye and varnish. After several years they will grow into mature plants producing fruits ready for the resin harvest. Through this practice local people unconsciously involve in the *rotan jernang* conservation in the Bukit Tigapuluh National Park and its surrounding area.

Another method to make red resin is by drying mature fruits in the sun and then the fruit scales are scrapped with cockle-shells to get red resin and the resin obtained is wrapped in cloth, softened in hot water and then molded (Dransfield and Manokaran, 1996).

Other uses of rotan jernang

In Europe dragon's blood has been used as medicine against dysentery and diarrhea as well as for astringent in the tooth-powders. Only small amount of dragon's blood in Malaysia has been used in the medical treatment such as for digestive problem, stomachache, and *sariawan*. Dragon's blood has ingredients of resin alcohol 'draco-resinotannol' 56%, benzoic acid and benzolactic acid (Burkill, 1935). Local people 'Semai' in Malay Peninsula use red resin of *Daemonorops didymophylla* as medicine, and cane for thatching. In Sarawak fruit of this rattan can be eaten as well (Dransfield and Manokaran, 1996). The trade of the resin for medicinal uses has reached a commercial and international proportion as is evidenced by the preponderance of leaflets advertising various products as well as scientific articles; by 2005 Internet that has listed over 2000 references on the subject. Chapman & Hall/CRC (2001), for instance, provided chemical formulae, structure and properties of various compounds and their derivatives obtained from resin produced by *D. draco*, while Starwest Botanicals (2005) advertised Dragon's blood chunks or Xue Jie widely.

CONCLUSIONS

Daemonorops draco (Willd.) Bl. or locally known as rotan jernang is a name of uncertain application, because there is no type specimen of this name. Actually, the basionym of *D. draco* is *C. draco* described by Willdenow based on Palmijuncus draco of Rumphius. Beccari (1911), Furtado (1953) and Dransfield (1979) have attempted to account for old names such as *C. draco*. However, the truth of the matter is that we could choose any dragon's blood species as being *P. draco* of Rumphius, because it is impossible to say what sort of rattan Rumphius was referring to. In this case, it is better to regard to *C. draco* as a name of uncertain application. In view of the above facts a new type specimen was selected for species of dragon's blood group that fits characteristics of *Daemonorops draco* (Willd.) Blume.

The *rotan jernang* has been long used by some indigenous tribes in Sumatra; we observed that it is particularly used within the area of Bukit Tiga Puluh National Park (BTPNP) in the border of Riau and Jambi Province. In this area the Talang Mamak and Anak Dalam or Kubu tribes have used *rotan jernang* a great deal. How they make this 'jernang' as follows the collected fruits are dried under the sun. Dried fruits are placed in a basket, pounded with a piece of wood and shaken. The friction resulted from this treatment detaches the resin, which falls through the basket into a piece of cloth placed below, as a gritty powder. This powder is further pounded to make it into dust which is then mixed with hot water in a plastic bag and later molded into cakes or sticks. After extraction of resin the seeds are thrown away and let them to grow in places where local people make dye and varnish. After several years they will grow into mature plants

producing fruits ready for the resin harvest. Through this practice local people unconsciously involve in the *rotan jernang* conservation in the Bukit Tigapuluh National Park and its surrounding area.

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