

## A New Record of *Dryobalanops beccarii* (Dipterocarpaceae) from Peninsular Malaysia

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### Abstract

*Dryobalanops beccarii* Dyer, Dipterocarpaceae, first described and recorded from Borneo, has now been documented from Johore, Peninsular Malaysia, where it grows on ridges in several compartments in the Panti Forest Reserve, Kluang Forest Reserve, and the Labis Forest Reserve. It is a large tree frequently reaching 40 m height and more than 1 m diameter.

### Introduction

Two species of *Dryobalanops*, *D. aromatica* and *D. oblongifolia*, were recorded for Peninsular Malaysia (Ashton, 1982). The genus *Dryobalanops* is clearly distinguished from other dipterocarp genera by the presence of five wing-shaped, subequal fruit calyx lobes and closely parallel venation on its leaf blade. In Peninsular Malaysia, trees of both species are characterized in the field by scaly bark, peeling in large, irregular, thin flakes. In *D. oblongifolia*, leaves are oblong or oblong-lanceolate and the fruit calyx lobes are shorter than the nut, while in *D. aromatica*, leaves are oval or sub-ovate and the calyx lobes are longer.

During a plant diversity enumeration exercise in the Virgin Jungle Reserves (VJR) network in Peninsular Malaysia, Ang Khoon Cheng and Kamarudin Saleh discovered in Kluang Forest Reserve (FR) and the VJR in Labis FR, Johore, trees that had leaves that closely resembled *D. aromatica* but the bark was distinctly different in that the outer bark was scaly, very shallowly fissured and had a laminate inner bark. It was clear that these populations belonged neither to *D. aromatica* nor *D. oblongifolia* but their identity could not be confirmed in the absence of flowers and fruits.

A dipterocarp mast-fruiting episode occurred in Peninsular Malaysia during the second and third quarters of 2002. Taking advantage of this cyclic event, teams from the Botany and Seed Technology Units, Forest Research Institute Malaysia (FRIM), launched an extensive fruit collection exercise, targeting species that are rare and/or threatened. Fruiting trees in several of these *Dryobalanops* populations

enabled materials for herbarium specimens and fruits for *ex situ* planting to be collected. The identity of the species could be confirmed and proved to be *D. beccarii* Dyer. A full description of the species based on characters from these populations is provided below.

**Dryobalanops beccarii** Dyer J. Bot. 12 (1874) 100; Ashton, Fl. Malesiana 1 (9) (1982) 375. Type: Malaysia, Sarawak, Matang, *Beccari PB2944* (K, lecto).

Large tree to 30 m tall, 63.7 cm diam., with small buttress to 1.5 m tall. *Bark* shallowly fissured to scaly, flaky and peeling off in pieces on the lowest part of the trunk immediately above the buttress, greyish-white; inner bark laminate, reddish-brown; sapwood yellowish brown, exuding resin when cut. *Twigs* 3 mm diam., glabrous, drying almost black. *Leaves* thickly coriaceous, glabrous, drying brown above, dark brown below; petiole 10–17 mm long, 1 mm thick, glabrous, drying almost black; blade broadly ovate, 3.5–6.3 x 2.4–3.7 cm, apex tapering to a 7-mm long acumens, base broadly cuneate to rounded, margin thickened, midrib prominently raised below, sunken above, secondary veins numerous, closely parallel, faint on both surfaces, smelling of camphor smell when crushed. *Flowers* not seen. *Fruit* calyx glabrous, shallow cup tapering gradually and cuneate at the pedicel, lobes 5, equal, oblong-spathulate, base to 2 mm, yellowish green when fresh, 4.0–6.5 x 0.6–1.0 cm, veins conspicuously raised on both surfaces, nut ovoid, glabrous, yellowish green when fresh, to 1.4 x 0.9 cm, style remnant 1 mm long, free from calyx except the base.

Vegetatively, the leaf morphology of *Dryobalanops aromatica* and *D. beccarii* is very similar and hence it is difficult to differentiate them when sterile. However, the bole character as described above can readily distinguish the two species. In addition, the fruits of *D. beccarii* are different from *D. aromatica* (Table 1).

**Table 1:** The bark and fruit characters of *Dryobalanops aromatica* and *D. beccarii*

	<i>D. aromatica</i>	<i>D. beccarii</i>
Outer bark	long, thin, recurved, irregular scales	shallowly fissured to scaly scales
Inner bark	fibrous	laminate
Fruit calyx size (cm)	4.0–6.0 x 0.8–2	4.0–6.5 x 0.6–1.0
Max. nut size (cm)	3 x 1.5	1.4 x 0.9

*Specimens examined:* Johore: Compartment 6B in Pantii FR, *Damahuri S. FRI 43567*, 7 August 2002 (KEP), *Ang K.C. FRI 43651*, 13 August 2002 (KEP); Kluang FR, *Ang K.C. FRI 43653*, 14 August 2002 (KEP).

### *Geographical distribution in Peninsular Malaysia*

In Peninsular Malaysia, *Dryobalanops beccarii* is known only from Johore from three localities, namely in compartments 6A, 6B, 7, 8A and 8B, Panti FR; in compartment 132, Kluang FR; and in compartment 841 in VJR, Labis FR.

Prior to this discovery, *D. beccarii* was only known to occur in Borneo on leached sandy soils on coastal hills and inland ridges below 700 m (Ashton, 1982). Like *D. aromatica* and *D. oblongifolia*, it shows the same pattern of geographic distribution in southern Johore and west Borneo. Corner (1958) has drawn attention to the similarity in the floras of these two regions, which he termed the Riouw pocket.

### *Ecology*

In Johore, this species is found in the lowland dipterocarp forest at about 75 m altitude, confined to ridges. They are large trees in the emergent and main canopies. On some ridges, it is co-dominant with *Shorea curtisii* Dyer ex King. In Kluang FR, it grows sympatrically with *D. aromatica* on steep hill slopes. In all the three sites, *D. beccarii* grows gregariously. In Borneo, the species is locally abundant on leached sandy soils on coastal hills and inland ridges below 700 m.

### *Germination*

Three seed batches of mature fruits were collected from five trees in Panti FR and six trees in Kluang FR in August 2002 and germinated with the seed wings removed in the FRIM nursery (Table 2). Germination is deemed to begin when the radicle protrudes through the seed coat. Germination is epigeal. The hypocotyl elongates to c. 1.8 cm. The emergent cotyledons are bilobed, fleshy and unequal. The first two leaves are opposite. In some seedlings, branching may begin at the first node.

Mean percentage germination was  $73 \pm 12$  s.d., the percentage varying from 62 to 86 (Table 1). All three seed batches showed a typical germination sigmoid curve (Fig. 1).

The germination period for *Dryobalanops beccarii* seed batches was longer than that of *D. aromatica* (100% within 20 days, Ng 1991, Siti Asha *et al.* 1995, Tamari 1976) and *D. oblongifolia* (100% within 10 days, Siti Asha *et al.* 1995 and 33 days, Ng 1991). In addition to the longer germination period, the three seed batches of *D. beccarii* achieved a maximum germination percentage of only 86.

### *Conservation notes*

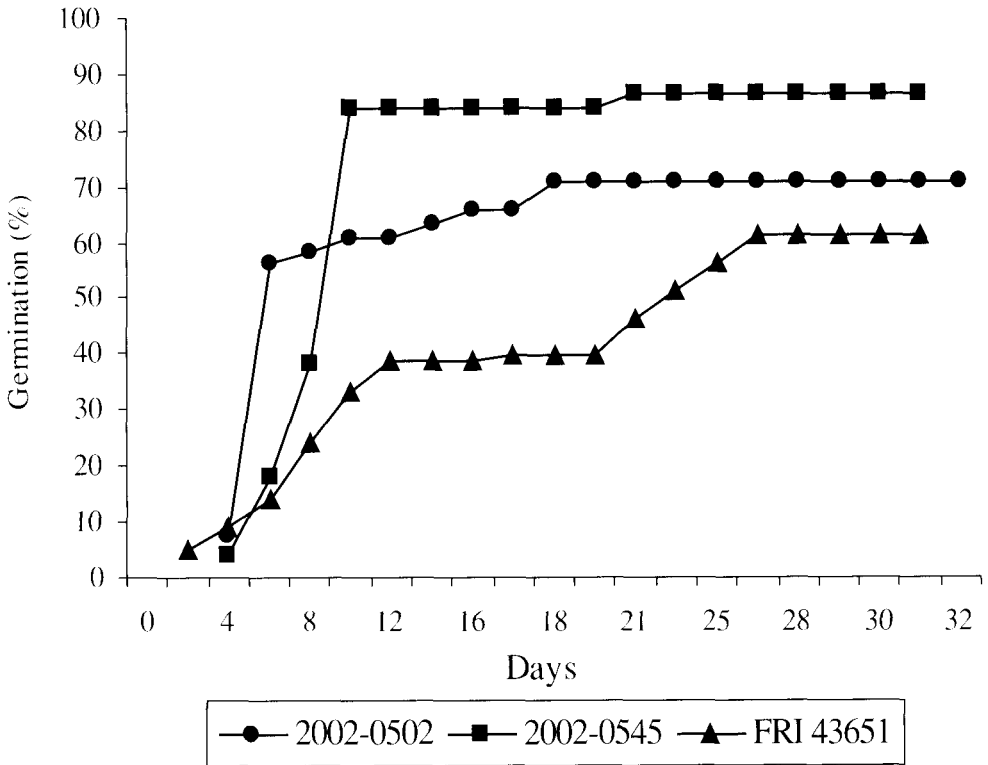
In Panti FR, ground checks in August 2002 indicated that the boundary of compartments 6B, 8A and 8B, which forms part of the forest reserve boundary, is adjacent to land being developed for small-scale agriculture activities. Because agriculture has a propensity for expansion, it is recommended that the forest office regularly monitors this section of the boundary to ensure its integrity and prevent future conflict. Compartments 6B, 8A and 8B had been logged in 1982/83. These

compartments are neither VJR nor are they above 1000 m elevation and hence have no legal protected status and may be licensed out for timber harvesting. Populations in Labis VJR and in Compartment 132, Kluang FR have a much brighter prospect as these forests are virgin and VJR and water catchment areas have protected status. Studies are currently being undertaken to determine the species' population size and genetic structure.

In view of the above scenario, *Dryobalanops beccarii* in Peninsular Malaysia is given the 2001 IUCN category of Endangered EN A3dB1. *D. beccarii* falls within the A3 category (there will be a projected or suspected population size reduction of  $\geq 50\%$  within the next 10 years or three generations, whichever is the longer); 'd' (the reduction can be based on actual or potential levels of exploitation); and B1 (its geographic range, in the form of the extent of occurrence, is estimated to be less than 5000 km<sup>2</sup>).

**Table 2.** Percentage germination and survival in three seed batches of *Dryobalanops beccarii*

Batch No.	2002-0502 (FRI 43567)	2002-0545 (FRI 43653)	FRI 43651
Locality	Panti FR, Compartment 6B	Kluang FR	Panti FR, Compartment 6B
Collector	Damahuri S	Ang KC	Ang KC
Date planted	12 August 2002	16 August 2002	16 August 2002
No. sown	41	617	78
Max. germination (%)	71	86	62
Germination period (days)	4-32	4-31	2-31
No. days to achieve 50 % germination	6	9	23
% seedling survival after 1 month	22.8	72.8	100



**Figure 1: Germination curve for three different seed batches of *Dryobalanops beccarii***

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### References

- Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana*. Ser. 1, **9**: 237–552.
- Corner, E.J.H. 1958. An introduction to the distribution of *Ficus Reinwardtia* **4**: 15–45.
- IUCN, 2001. *IUCN Red List Categories. Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Ng, F.S.P. 1991. Manual of Forest Fruits, Seeds and Seedlings. *Malayan Forest Records* No. 34, Vol. 1. Forest Research Institute Malaysia. Kuala Lumpur. 400 pp.
- Siti Asha A.B., K.C. Ang, and S. Zaiton. 1995. Records of germination trials of dipterocarp seeds at FRIM, Kepong, 1979–1994. *Research Data* No. 4. Forest Research Institute Malaysia. Kuala Lumpur. 161 pp.
- Tamari, C. 1976. Phenology and seed storage trials of Dipterocarps. *FRI Research Pamphlet* No. 69. Forest Research Institute Malaysia. Kuala Lumpur. 73 pp.