AN ASSESSMENT OF THE GROWTH OF PLANTATION GROWN *PENTASPADON MOTLEYI* (PELONG)

Ahmad Zuhaidi Yahya & M. Noor Mahat

Forest Research Institute Malaysia, Kepong, 52109 Kuala Lumpur

Pentaspadon motleyi Holmes, a member of the Anacardiaceae family, is naturally distributed in the lowland forests from Sumatra to New Guinea and Solomon Islands, as well as Peninsular Malaysia (Kedah, Perak, Selangor, Terengganu, Pahang and Johore). It is commonly known as 'pelong' in Peninsular Malaysia and 'pelajau' in Sabah and Sarawak (Corner 1988). It occurs naturally in low-lying, undulating land, especially near streams and in seasonal swamp forests (Browne 1955, Anonymous 1986).

The trees are fairly large, reaching up to 36 m in height and 80 cm in diameter at breast height, usually with spreading buttresses and graceful, feathery crowns. Browne (1955) and Appanah and Weinland (1993) reported that the trees can reached 14 - 17 cm diameter at breast height and 21 m height after 11 years. Ng and Tang (1974) found that *P. motleyi* planted in the Forest Research Institute Malaysia arboretum had the largest diameter at breast height of 42.8 cm at the age of 24 y.

The leaves range from 10 to 30 cm long with 7-9 leaflets; leaflets are usually opposite, apex pointed with rounded base and pinkish in colour when young (Kochummen 1989). The bark is grey-white with pink inner bark and sometimes with whitish sap when cut. Leaves are compound and clustered at the end of the twigs. It flowers twice annually from March to May and subsequently in October until November (Burgess 1966). When in flower the trees are conspicuous with full bloom and without leaves.

The timber is categorised as a light hardwood timber with light yellow-green heart-wood. The sapwood is white with a green tinge when fresh or light yellow with a pink tinge, 2-3 cm wide and not always clearly differentiated. The timber is easy to work with and suitable for general utility, interior furnishing, panelling, partitioning, moulding and other planking works (Wong 1975).

To date the species has not been planted on a large scale. A few research plots of this species exist in the Bukit Lagong Forest Reserve, Selangor, Peninsular Malaysia. One of them was re-measured recently. The 0.2-ha stand of *P. motleyi* was established in April 1956. The area is located in the center of Peninsular Malaysia at 3° 14' N and 101° 38' E. The mean daily temperature ranges from 27 °C to 30 °C. The annual rainfall is between 2000 and 2900 mm.

The stand is located on the lower slope of the lower ridge of the Bukit Lagong range at an altitude of 100 to 150 m above sea level. The soil is a light reddish loam, shallow with underlying rock and granite, and has good drainage. In the trial, 204 seedlings were line-planted at a spacing of 3.5 × 3.0 m (950 trees ha^{-1}). The area was formerly covered with secondary vegetation, and *Arenga equisetifolia* (langkap) palms are common. From 1956 until 1961, 17 weeding and 13 climber cutting operations were carried out. Thinning was carried out in 1961 with the removal of 53 trees within the diameter classes ranging from 4.8 to 18.7 cm.

The diameter at breast height was measured 5 y after planting in 1961. Figures in Table 1 show the diameter and survival growth performance of *P. motleyi* in Bukit Lagong Forest Reserve, Selangor. Seventy-six trees or 41.3 % of the population achieved the diameter classes of 11.8 to 13.9 cm.

Table 1. Growth of 5-y-old *Pentaspadon motleyi* stand, Bukit Lagong Forest Reserve, Selangor, Peninsular Malaysia (184 trees)

Diameter classes at breast height (cm)	Number of trees	(%)
2.5 - 4.7	3	1.6
4.8 - 6.9	2	1.0
7.0 - 9.1	4	2.2
9.2 - 11.7	46	25.0
11.8 - 13.9	76	41.3
14.0 - 16.2	53	28.8

In the recent measurement the diameter at breast height was measured at 100 percent enumeration. The total tree height and clear bole height were measured on all trees. The height curve was determined using the method of least squares. The model used, following Curtis (1967), was:

$$h = a + b \log (d)$$

where

h = total height in m
d = diameter at breast height in cm
a,b = coefficients of the regression function

From this height curve, dominant height, mean height and mean clear bole height were determined.

The average volume per tree (v) was calculated using diameter and height of stem (clear bole height), and volume per ha (V) by multiplying the average volume per tree with the stem number ha^{-1} (N) and an assumed reduction factor of 0.6 for taper. Table 2 presents the standing stock of *P. motleyi* at a stand age of 38 y.

Table 2. Standing stock of planted *Pentaspadon motleyi*, Bukit Lagong Forest Reserve, Selangor, Peninsular Malaysia

Age	N (ha^{-1})	h_{dom} (m)	d_{dom} (cm)	h_g (m)	h_c (m)	d_g (cm)	G (m²)	V (m³ha^{-1})	$V_{m.a.i.}$ (m³ha^{-1}y^{-1})
38	240	41.9	46.7	39.1	32.6	41.3	32.23	630.42	16.59

N - number of trees ha^{-1}
h_{dom} - mean height of 100 biggest trees ha^{-1}
d_{dom} - mean diameter at breast height of 100 biggest trees ha^{-1}
h_g - mean height of the stand
h_c - mean clear bole height
d_g - mean diameter of the stand
G - basal area ha^{-1}
V - volume ha^{-1}
$V_{m.a.i.}$ - mean annual volume increment

The stand was initially planted at a density of 950 stems ha⁻¹. As a result of mortality, caused mainly by competition, the density declined to 240 stems ha⁻¹ in 38 y.

The mean height and diameter of the dominant trees (100 biggest trees ha⁻¹) had an average of 41.9 m and 46.7 cm respectively. The overall mean height and diameter were 39.1 m and 41.3 cm respectively. The calculated mean clear bole height was 32.6 m. The calculated standing volume (clear bole volume) was 630 m³ ha⁻¹ which is equivalent to mean annual volume increment of 16.6 m³ ha⁻¹ y⁻¹.

Figure 1 shows the diameter distribution in the population of the the 38-y-old *P. motleyi* stand. The diameter ranges from 24.2 to 56.8 cm. The wide diameter range for a whole population is not necessarily disadvantageous as long as the size of the potential final crop trees is within a relatively narrow range. Fifty-two percent of the trees lie within the diameter classes of 40 - 49.9 cm.
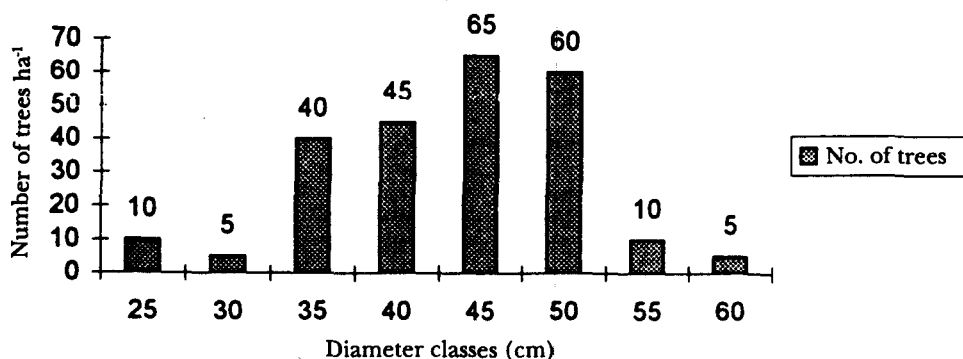

Figure 1. Diameter distribution of *Pentaspadon motleyi* (Field 18 B), Bukit Lagong Forest Reserve, Selangor, Peninsular Malaysia

The results of the assessment show that *P. motleyi* can be cultivated successfully in plantation and grow in the presence of shade. It needs regular spacing to achieve desirable stem forms. Based on the assessment it was found that forking is not common and the trees are largely self-pruning without major diseases or damage. The potential of the species seems to be high. Nevertheless, before the species can be planted on an operational scale, the factors that contribute to the wide diameter size variation have to be known, or whether such variation is a common phenomenon of even-aged, pure *P. motleyi* stands. A tree selection programme may be required to achieve a more uniform growth performance within the population.

This study was a first assessment of the growth potential of *P. motleyi* plantation over a period of almost 40 years. The results have to be judged with caution, since they were obtained from an unreplicated small plantation plot, which was designed as a demonstration plot and not as a formal experimental trial. It is emphasised that growth performance may deviate for the better or worse depending on the site quality.

Acknowledgements

References

ANONYMOUS. 1986. *100 Malaysian Timbers.* Malaysian Timber Industrial Board. 226 pp.

APPANAH, S. & WEINLAND, G. 1993. *Planting Quality Timber Trees in Peninsular Malaysia. A Review.* Malayan Forest Records No. 38. Forest Research Institute Malaysia, Kepong, Kuala Lumpur. 247 pp.

BROWNE, F.G. 1955. *Forest Trees of Sarawak and Brunei.* Government Printer, Kuching, Sarawak 1955. 112 pp.

BURGESS, P.F. 1966. *Timbers of Sabah.* Sabah Forest Records No. 6 . Forest Department Sabah: 30-32.

CORNER, E.J.H. 1988. *Wayside Trees of Malaya.* Malayan Nature Society. 465 pp.

CURTIS, R.O. 1967. Height-diameter age equation for second Douglas-fir. *Forest Science* 13(4): 365-375.

KOCHUMMEN, K.M. 1989. Anacardiaceae. Pp. 46-47 in Ng, F.S.P. (Ed.) *Tree Flora of Malaya.* Malayan Forest Records No. 26 (4). Forest Research Institute Malaysia.

NG, F.S.P. & TANG, H.T. 1974. Comparative growth rates of Malaysian trees. *Malaysian Forester* 37 (1) : 2 - 23.

WONG, T.M. 1975. *Wood Structure of the Lesser Known Timbers of Peninsular Malaysia.* Malayan Forest Records No. 28. Forest Research Institute Malaysia, Kepong, Kuala Lumpur. 115 pp.