NOTES

EFFECTS OF OPEN AND UNDER PLANTING ON EARLY SURVIVAL AND GROWTH OF *ENDOSPERMUM MALACCENSE* (SESENDOK), *ALSTONIA ANGUSTILOBA* (PULAI) AND *SHOREA PARVIFOLIA* (MERANTI SARANG PUNAI)

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Meranti sarang punai, sesendok and pulai are useful indigenous timber species that have relatively high growth rates (Syrnington 1943, Chew 1980, Wan Razali 1988, Darus *et al.* 1990). Hence, the potential of these three species for future plantation program must not be overlooked.

Sesendok and pulai are pioneer species that could be open planted. Chew (1980) observed vigorous growing of sesendok wildings in open planting. Lim *et al.* (1990) observed that pulai grows better without nurse tree in open planting. However, the effects of open and under planting on the early survival and growth of these two species are yet to be determined. Meranti sarang punai is known to be a primary forest species. Successful establishment of meranti sarang punai in secondary forests was recorded but little is known about its performance in the open (Watson 1935, Wyatt-Smith 1949, 1958).

A planting trial of sesendok, pulai and meranti sarang punai was carried out in November 1987 at the Sungai Buloh Forest Reserve, Selangor. For each species, a hundred seedlings (three to four months old) were planted in a secondary forest, a denuded site where 30 *cm* of top soil was removed and an open site where top soil was retained. Within the secondary forest site, all trees greater than 20 *cm* dbh were girdled four months before planting. Planting was undertaken at 5 *m* between lines and 2 *m* within lines. Canopy opening involving the removal of shade branches from neighbouring trees was carried out 15 months after planting. For the open sites, planting was carried out at 2 x 2 m.

In all the three sites, soil samples were collected for analysis of N, P, K, CEC (Cations Exchange Capacity) and pH (wet), while soil compaction was measured using a penetrometer.

At 23 months after planting, the percentages of survival for all the three species in the three sites were almost similar. Values ranged from 86 to 90%, 73 to 77% and 72 to 79% for sesendok, pulai and meranti sarang punai, respectively (Figure 1). It was noted that about 8% of the seedlings planted within the secondary forest were damaged by fallen branches from girdled neighbouring trees.

Figure 2 illustrates the average total height of each species at 23 months after planting. All seedlings planted at the open site showed the greatest height growth. This was followed by the denuded site and secondary forest.

Soil analysis indicated that the secondary forest had the highest values of N,P,K and CEC at soil depths of 1 to 15 *cm* and 15 to 30 *cm,* followed by the open site and lastly the denuded site (Table 1). The soil pH values of the three sites were almost similar. In terms of soil compaction, the denuded site was most severe, followed by the open site

and the secondary forest (Table 2) .It should be noted that although the secondary forest was richer in N, P, K and had higher CEC, average total height growth was superior in the open and denuded sites. This indicates that light availability may have greater influence on height growth of the three species than soil properties.

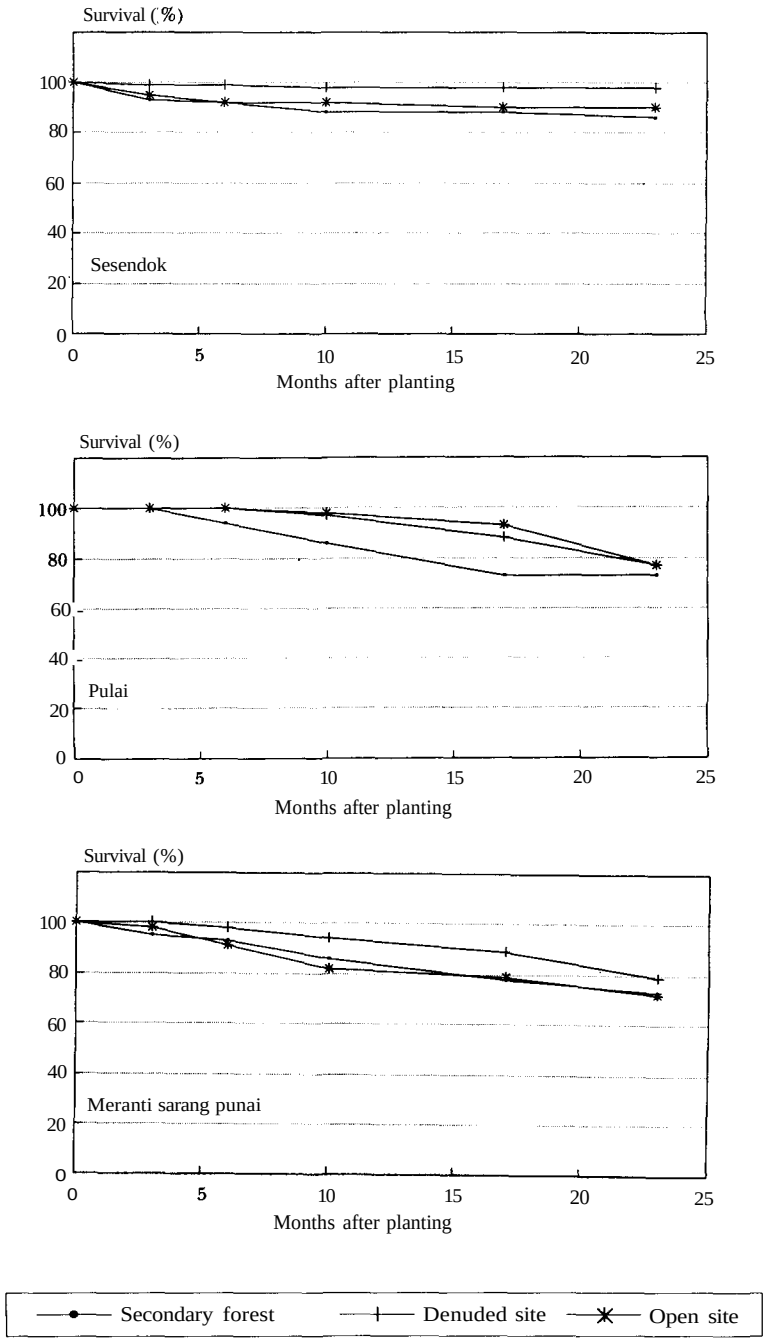

Figure 1. Survival percentages of sesendok, pulai and ofmeranti sarang punai planted at three different sites

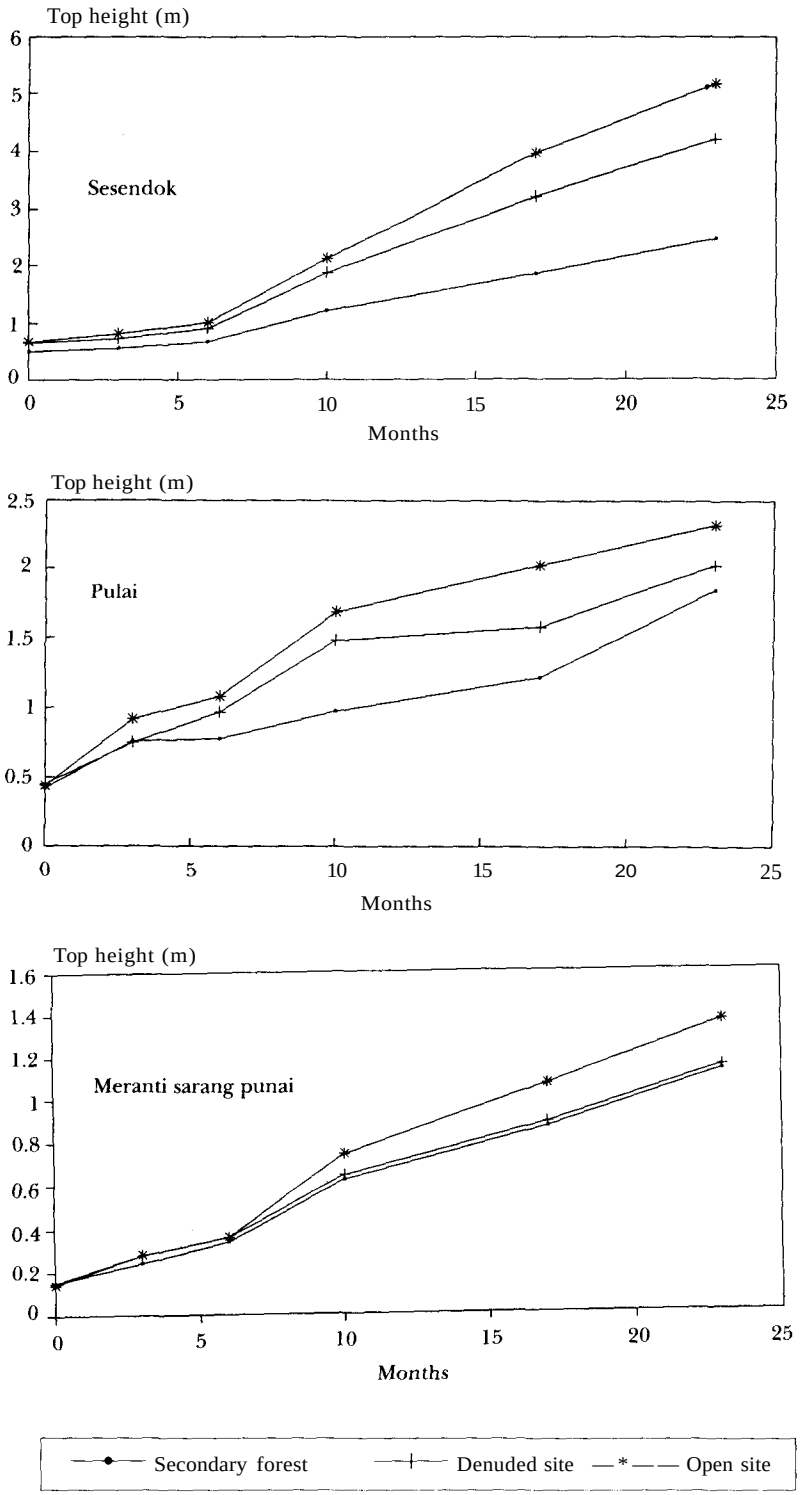

Figure 2. Average top height of sesendok, pulai and meranti sarang punai planted at the three different sites

Table 1. Average values of N, P, K, CEC and pH of the soils from the three planting sites

Element	Secondary forest	Open site	Denuded site
1-15 cm soil depth:			
N(%)	0.15	0.10	0.10
P(p.p.m.)	5.77	4.73	4.43
K(meq/I00g)	0.07	0.05	0.04
CEC(meq/WOg)	6.18	5.22	4.19
pH(wet)	4.24	4.25	4.23
15-30 *cm soil* depth:			
N(%)	1.38	1.25	1.19
P(p.p.m.)	5.18	3.90	3.26
K.(meq/I00g)	0.06	0.04	0.03
CEC(meq/100g)	5.14	4.87	3.35
pH(wet)	4.37	4.29	4.43

Table 2. Soil compaction *(kg* cm^2) for the three planting sites

	Number of samples	*kg* cm^{-2}(sd)
Denuded site	56	2.31 (1.04)
Open site	67	1.93 (0.99)
Secondary forest	76	1.31 (0.63)

In open planting where availability of light is not a limiting factor, all the seedlings planted at the denuded site had lower average total height than those planted within the open site. This difference could be probably due to the more compacted soil and lower N, P, K, CEC in the former.

In conclusion, this preliminary study indicates that these three species are suitable for open planting and that they can also be used for reclamation of denuded areas.

Acknowledgement

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A NOTE ON THE EFFECT OF LEAF NUMBER ON ROOTING OF *HOPEA ODORATA* STEM CUTTINGS

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One of the factors affecting the formation and development of adventitious root on stem cuttings is the presence of leaves (Hartmann & Kester 1983). For example, leafless cuttings of *Triplochiton scleroxylon* were found to root very rarely (Leakey *et al.* 1982). Avidan and Lavee (1978) also found negligible rooting in defoliated cuttings of several cultivars of *Oka* species. Similar results were obtained with leafless cuttings of *Acacia mangium* (Darus 1988). Some species also require an optimum leaf area for a maximum rooting percentage. This has been demonstrated by Leakey *et al.* (1982) where leaf area of 50 cm^2 was optimum for the rooting of *T. scleroxylon* stem cuttings. This study was to investigate the effect of leaf number on the rooting of *Hopea odorata* stem cuttings.

Stem cuttings of *H. odorata* were taken from *9-mth-old* seedlings raised in the nursery. The average height of these seedlings was about 48 *cm.* Five types of cuttings were prepared for the experiment, *viz* 1) single node cutting with half-leaf (+ 10cm^2), 2) single node cutting with one leaf (+ 20 cm^2), 3) two node cutting with two half-leaves (+ 20 cm^2 , 4) two node cutting with two leaves (+ 40 $cm^{2)}$, 5) leafless cuttings. These cuttings were planted in pure river sand medium (60% with less than 2 *mm* and 40% with more than 2 *mm* diameter of particle size). They were arranged in a completely randomized design with six replications for each treatment. Ten cuttings were used for each treatment and a total of 300 cuttings were planted. The planted cuttings and the rooting medium were kept moist by an automatic mist sprinkler system operated at hourly intervals and each duration of spray was about one minute. In addition to this, the rooting bed was covered with clear plastic sheet supported by wooden frame to maintain a high humidity around the cuttings. Observations were carried out at twelve weeks after planting and all cuttings were lifted to assess the rooting and the root number of every rooted cutting.

The results show that the leafless cuttings produced almost negligible rooting (1.7%) and all the unrooted cuttings were dead. The highest rooting percentage was achieved with cuttings with one leaf (86.7%) followed by two leaves, two half-leaves and half-leaf (Table 1). These results indicate that the presence of leaves was necessary for rooting of *H. odorata* cuttings.