be used as sawn timber, various undesirable characteristics might be encountered such as excessive longitudinal shrinkage of wood, problems in the machining and woodworking and defects associated with the seasoning of wood. All these properties would result in the juvenile wood being unsuitable for solid wood production.

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# A NOTE ON THE ROOTING OF *SHOREA ACUMINATA* AND *SHOREA PARVIFOLIA* LEAFY STEM CUTTINGS

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*Shorea acuminata* (meranti rambai daun) and *Shorea parvifolia* (meranti sarang punai) are two of the common commercial red meranti species. However, both species are considered difficult to root by leafy stem cuttings (Eric 1979, Alias 1984) compared to other dipterocarps. This experiment investigated the rooting ability of leafy stem cuttings of young seedlings of *S. acuminata* and *S. parvifolia* with respect to positions, IBA concentrations and rooting media.

Three half-leaf stem cuttings (two-node cutting) of both species were taken from 18-*mth*-old potted seedlings : terminal (second node from apex), middle (fourth node) and basal (sixth node). A nested experimental design was employed involving a total of 480 cuttings. They were then subjected to a hormonal treatment of six levels: 0 $\mu$ *g* IBA (indole butyric acid) ( control), 75 $\mu$ *g* IBA, 100 $\mu$ *g* IBA, 125 $\mu$ *g* IBA, 150 $\mu$ *g* IBA and 100 $\mu$ *g* IBA + 100 $\mu$ *g* NAA (napthalene acetic acid) with 40 cuttings per species. The hormone was dissolved in methanol and applied to the basal ends of cuttings using the droplet method (instrument : pipette).

The cuttings were then inserted into two rooting media : coconut fibre and paddy husk. The rooting media were kept moist by an automatic mist sprinkler with a spraying duration of two minutes every half hourly. The propagation bed was maintained at 25 °C with 12 *h* photoperiods at an irradiance of 27 $Wm^{-2}$ and a relative humidity of 60%. Survival (number of lived cuttings) and rooting percentage of cuttings were assessed 14 weeks after insertion. The number and maximum length of roots per rooted cutting were also recorded.

Over 80% and 65% of the cuttings of both species (*S. parvifolia* and *S. acuminata*) survived and rooted respectively. This is contrary to past studies by Eric (1979) and Alias (1984) in which both percentages were below 20%. The juvenility of these seedlings, which limited physiological barriers to rooting (Hartmann & Kester 1983, Marmae 1983, Ng 1988, Liew 1992), could have caused this difference.

Results also indicated that terminal cuttings of both species in both media had the highest survival rate (*S. acuminata* : coconut fibre 95.8%, paddy husk 95.8%; *S. parvifolia* : coconut fibre 93.8%, paddy husk 91.7%) followed by middle and basal cuttings. In rooting percentage, distinct inconsistencies were observed between terminal (*S. acuminata:*

coconut fibre 79.5%, paddy husk 72.9%; *S. parvifolia* : coconut fibre 70.8%, paddy husk 70.8%) and middle cuttings (*S. acuminata*: coconut fibre 68.8%, paddy husk 77.1%; *S. parvifolia*: coconut fibre 77.1%, paddy husk 66.7%) (Table 1).

Hormonal application significantly effected rootability of cuttings for both species, especially those treated with 100 $\mu$ *g* (83.3% for *S. acuminata*) and 150 $\mu$ *g* IBA for *S. parvifolia* (83.3%) ($p < 0.01$), being the most desirable concentrations when planted in coconut fibre and paddy husk medium respectively.

Root development in *S. parvifolia* outperformed that in *S. acuminata*, especially in terms of root number (Table 2). Moreover, coconut fibre was a better medium than paddy husk for root development in terms of root length and number of cuttings. Roots produced in coconut fibre were also more fibrous and tapering possibly due to the more favorable composition and physical properties of the medium (Hartmann & Kester 1983, Kijkar 1991, Liew 1992).

**Table 1.** Summary of survival and rooting percentage

| Sources | | | Rooting percentage | | Survival percentage | |
|---|---|---|---|---|---|---|
| | | | *S. acuminata* | *S. parvifolia* | *S. acuminata* | *S. parvifolia* |
| | | No. of cuttings | | | | |
| Medium | Coconut fibre (CF) | 240 | 68.8 | 67.4 | 82.6 | 80.6 |
| | Paddy husk (PH) | 240 | 70.1 | 71.5 | 86.8 | 84.7 |
| Average | | | 69.5 | 69.5 | 84.7 | 82.7 |
| CF | Terminal | 80 | 79.5 | 70.8 | 95.8 | 93.8 |
| | Middle | 80 | 68.8 | 77.1 | 87.5 | 87.5 |
| | Basal | 80 | 58.3 | 62.5 | 64.6 | 72.9 |
| PH | Terminal | 80 | 72.9 | 70.8 | 95.8 | 91.7 |
| | Middle | 80 | 77.1 | 66.7 | 91.7 | 79.2 |
| | Basal | 80 | 64.6 | 64.6 | 72.1 | 70.8 |
| CF | T1 | 40 | 54.2 | 37.5 | 87.5 | 70.8 |
| | T2 | 40 | 75.0 | 83.3 | 75.0 | 95.8 |
| | T3 | 40 | 83.3 | 79.2 | 87.5 | 91.7 |
| | T4 | 40 | 70.8 | 79.2 | 87.5 | 87.5 |
| | T5 | 40 | 62.5 | 75.0 | 75.0 | 87.5 |
| | T6 | 40 | 66.7 | 75.0 | 83.3 | 75.0 |
| PH | T1 | 40 | 50.0 | 45.8 | 87.5 | 79.2 |
| | T2 | 40 | 58.3 | 62.5 | 83.3 | 66.7 |
| | T3 | 40 | 83.3 | 70.8 | 91.7 | 79.2 |
| | T4 | 40 | 66.7 | 79.2 | 83.3 | 87.5 |
| | T5 | 40 | 83.3 | 83.3 | 83.3 | 91.7 |
| | T6 | 40 | 79.2 | 62.5 | 91.7 | 79.2 |

CF - Coconut fibre
PH - Paddy husk
T1 - CONTROL
T2 - 75 $\mu$ *g* IBA
T3 - 100 $\mu$ *g* IBA
T4 - 125 $\mu$ *g* IBA
T5 - 150 $\mu$ *g* IBA
T6 - 100 $\mu$ *g* NAA + 100 $\mu$ *g* IBA

**Table 2.** Summary of root development

| Sources | | Total root number | Maximum root length (*mm*) | Root dry weight (*mg*) |
|---|---|---|---|---|
| CF | SA | 11.6 | 41.0 | 5.6 |
| | SP | 22.8 | 56.0 | 7.3 |
| PH | SA | 11.0 | 30.0 | 5.3 |
| | SP | 16.6 | 35.8 | 5.9 |

Note: Data are average of lived cuttings only, irrespective of cutting positions and hormonal treatment within the sources.

CF - Coconut fibre
PH - Paddy husk

SA - *Shorea acuminata*
SP - *Shorea parvifolia*

In conclusion, cuttings of *S. acuminata* and *S. parvifolia* rooted rather successfully compared to observations in previous studies by Eric (1979) and Alias (1984).

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