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ROOTING OF *HOPEA ODORATA* CUTTINGS FROM COPPICE SHOOTS AND THE GROWTH PERFORMANCE OF ROOTED CUTTINGS AT NURSERY STAGE

H. Aminah

Forest Research Institute Malaysia, Kepong, 52109 Kuala Lumpur, Malaysia

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AMINAH, H. 1996. Rooting of *Hopea odorata* cuttings from coppice shoots and the growth performance of rooted cuttings at nursery stage. Single node leafy cuttings of *H. odorata* taken from orthotropic shoot of coppice material of 10-y-old stock plants were tested for their rooting ability. Rooting percentage and number of roots produced per rooted cutting were significantly different among the stock plants. Rooting percentage from different stock plants fourteen weeks after planting ranged from 73.9 to 96.8 %. The growth performance of these rooted cuttings after potting were satisfactory. Height and diameter gains six months after potting were more than 40 cm and 6 mm respectively. The survival of potted cuttings during the six-month experimental period was 100%.

Key words: *Hopea odorata* - stock plants - coppice shoot - rooting percentage - height - diameter

AMINAH, H. 1996. Pengakaran keratan *Hopea odorata* daripada pucuk kopis dan prestasi pertumbuhan keratan pengakar di peringkat tapak semaian. Keupayaan pengakaran keratan satu ruas berdaun *H. odorata* dari pucuk ototropik beberapa pokok ibu yang berumur sepuluh tahun telah diuji. Peratus pengakaran keratan dan bilangan akar didapati ketara antara pokok-pokok ibu yang diuji. Peratus pengakaran selepas empat belas minggu ditanam adalah sekitar 73.9 hingga 96.8%. Pertumbuhan keratan yang berakar setelah ditabung adalah memuaskan. Pertambahan tinggi dan garis pusat enam bulan selepas ditabung adalah lebih 40 cm dan 6 mm masing-masing. Kadar kemandirian keratan yang ditabung selama enam bulan masa kajian dijalankan ialah 100%.

Introduction

Hopea odorata Roxb. belongs to the family Dipterocarpaceae. Its timber is commercially known as merawan, with a market established both locally and overseas. To sustain the supply of timber from this species, effort has been made to plant them in plantation and logged-over forest. The growth rate of this species is relatively fast with height increment in excess of 1 m per year (Wan Razali & Ang 1991). The species can be planted in open areas of both degraded and non-degraded land (Ang & Yusof Muda 1989, Wan Razali & Ang 1991,). To ensure the continuous supply of planting material, rooting experiments of stem cuttings have been carried out. Results obtained indicated that the species can be easily rooted using stem cuttings taken from young seedlings (Alias 1984, Aminah 1991a,b).

However, for regular supply of juvenile cutting material, coppice shoots obtained from pruned stock plants are usually used. The rooting of such cutting material has been practised on a large scale with many tree species such as *Picea abies* (Kleinschmits 1974), *Eucalyptus* species (Spears 1985), *Triplochiton scleroxylon* (Leakey 1987) and *Gmelina arborea* (Wong & Jones 1985). It has also been reported that cuttings of several *Dipterocarp* species could also be rooted from coppice shoots (Yasman & Smits 1988, Kantarli 1993, Smits *et al.* 1994). However, no experimental data on the growth of the rooted cuttings were presented in these reports. This paper reports an experiment carried out to test the rooting ability of coppice shoots from different stock plants and to assess the subsequent growth performance of rooted cuttings after potting at nursery stage.

Materials and methods

Cutting materials were taken in April 1992 from six of the stock plants grown in an open area in FRIM's nursery. The age of the stock plants was ten years old. These stock plants were planted on the ground when they were five years old. They had been regularly pruned to about 30 cm above ground level and coppice shoots were taken for the production of rooted cuttings. For this study, single node cuttings were taken from the first fully expanded leaf down to the seventh node of the orthotropic shoot. One whole leaf was retained on each cutting. The cuttings harvested were grouped according to the stock plant number and the total number of cuttings obtained per stock plant is given in Table 1. The length and diameter of the individual cutting were recorded. The base of each cutting was cut at a right angle to the stem and treated with Seradix 3 (0.8% IBA). These cuttings were immediately set to root using clean river sand medium in a rooting bed. The cuttings were kept moist by an automatic mist sprinkler system. The misting frequency was one minute per hour. The rooting bed was enclosed with translucent plastic sheets supported by a wooden frame. Additionally, the rooting bed was also shaded with two layers of green plastic netting thus allowing 15% of full sunlight intensity to reach the cuttings. After fourteen weeks in the rooting bed, the number of cuttings rooted and number of roots on each cutting were recorded. These rooted cuttings were then potted in black perforated polythene bags (17 cm height × 8 cm diameter). The potting mixture used was forest top soil and sand in the ratio of 3:1. To every cubic metre of this mixture, 1.2 kg triple super phosphate (46% P_2O_5) and 1.6 kg magnesium limestone (33% CaO) were added. These potted cuttings remained on the rooting bed for three weeks before being transferred to the nursery.

To assess the growth performance of rooted cuttings at the nursery stage, 30 potted cuttings from each stock plant were randomly chosen. These plants were arranged in randomised complete block design with six replications. The height of the new shoot formed on each cuttings and the basal diameter were measured every month until six months after potting. By this time, the plants reached the height of more than 30 cm and were suitable for outplanting. Throughout this experiment, the plants were shaded with one layer of plastic netting, allowing 50% of full sunlight intensity. Granular compound fertiliser ($12N: 12P_2O_5: 17K_2O: 2MgO$ + trace elements) was applied at the rate of 1g/plant/month. Watering was carried out twice a day, i.e., in the morning and late afternoon. Weeding, insecticide and fungicide applications were carried out whenever necessary.

Standard error for binomial data was calculated for rooting percentage as in Bailey (1959). A stepwise regression procedure (Payne *et al.* 1987) was used to determine the association of diameter, length and volume of cuttings with rooting ability. Using *t*-test the numbers of roots between cuttings of different stock plants were compared. Data on the height and diameter growth of the potted rooted cuttings were analysed using analysis of variance.

Results and discussion

Rooting of cuttings

Figure 1 shows that cuttings of stock plant 1002 rooted significantly better (96.8%) than cuttings of stock plants 1006, 1008 and 1007 (73.9%, 78.1% and 85.5% respectively). Rooting of cuttings of stock plant 1000 was significantly better when compared to cuttings of stock plants 1006 and 1008. Similar result was obtained with rooting of cuttings from stock plants 1001 and 1006 (89.1% against 73.9%).

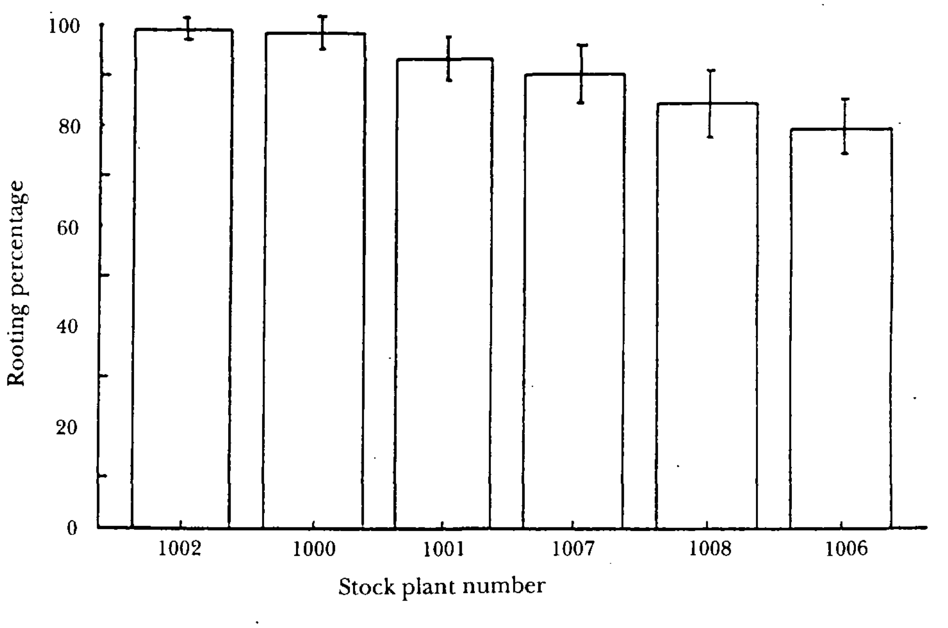

Figure 1. Rooting percentage of *Hopea odorata* cuttings taken from different stock plants (n = 42, 55, 62, 65, 55 and 41 for stock plants 1000, 1001, 1002, 1006, 1007 and 1008 respectively; bar = ± standard error of mean)

From the *t*-test, the numbers of roots of cuttings from stock plants 1000, 1008 and 1002 were significantly more than those of 1007 and 1006. The cuttings from stock plant 1000 were found to produce significantly more roots than cuttings from stock plant 1001 (Table 1).

Table 1. *t*-test for the mean number of roots per rooted cutting of *H. odorata* from different stock plants at fourteen weeks

Stock plant number	Total number of cuttings	1008	1002	1001	1006	1007	Mean ± S.E.
1000	42	ns	ns	*	**	**	5.30 ± 0.28
1008	41		ns	ns	*	**	4.97 ± 0.33
1002	62			ns	*	**	4.92 ± 0.27
1001	55				ns	ns	4.37 ± 0.27
1006	65					ns	4.06 ± 0.25
1007	55						3.62 ± 0.26

* : Significant at $p \leq 0.05$ for the two respective stock plants,
** : Significant at $p \leq 0.01$ for the two respective stock plants,
ns : Not significant at $p \leq 0.05$ for the two respective stock plants,
S.E = Standard error of mean.

The differences in rooting ability among these stock plants may be due to genetic variation since the stock plants were planted from seedlings having different genotypes. Differences in rooting ability of cuttings from clones from different genotypes were noted in several species such as *T. scleroxylon* (Leakey *et al.* 1982), *Eucalyptus globulus* (Wilson 1992) and *Picea abies* (Kleinschmit 1974).

The influence of other morphological characterestic such as length, diameter and volume of cuttings on their rooting ability was not significant in this study. This may suggest that the ranges of cutting length (2.8 to 8.5 cm) and diameter (1.6 to 6.04 mm) are suitable for rooting of *H. odorata* cuttings. Cutting length of *Prosopis juliflora* (Dick *et al.* 1991) and cutting diameter of *Acacia tortilis* (Dick & East 1992) were also found not to affect their rooting ability. In contrast, cutting length could be an important variable in determining the rooting ability of cuttings in other species such as *Triplochyton scleroxylon* (Leakey 1983) and *Eucalyptus camaldulensis* (Geary & Harding 1984). When cuttings of *T. scleroxylon* were cut to the same length, basal cuttings with larger diameters were found to root better and it was suggested that cuttings depended to some extent on carbohydrate reserves in the stem for root formation (Leakey & Mohammed 1985).

Growth of rooted cuttings after potting

Figures 2 and 3 show the rate of height and diameter growth of potted cuttings of *H. odorata* from different stock plants within six months. Analysis of variance showed that the height and diameter gains of six-month-old potted cuttings were not significantly different between the stock plants. The differences in height and diameter were not revealed probably because the plants were at the early stage of growth in the pots and the differences might be observed at the later stage of growth when their genetic potential is fully expressed. Also, the numbers of samples used in this experiment were small. The height and diameter gains obtained for all the stock plants tested were more than 40 cm and 6 mm respectively. With the attainment of this height, the plants could be planted in the field as was found in other species such as *Acacia mangium*, *Gmelina arborea* and *Paraserianthes falcataria* (Darus 1983). The survival of the rooted cuttings after potting was 100%. No mortality occurred during the six-month experimental period.

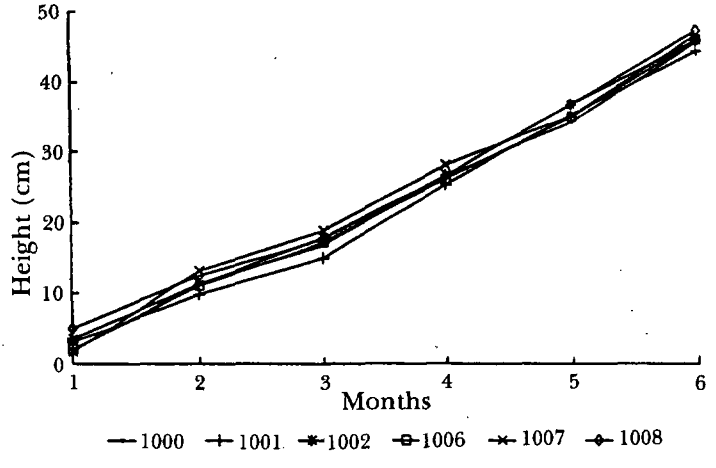

Figure 2. Height growth of potted rooted cuttings of *Hopea odorata* from different stock plants (n = 30 per stock plant)

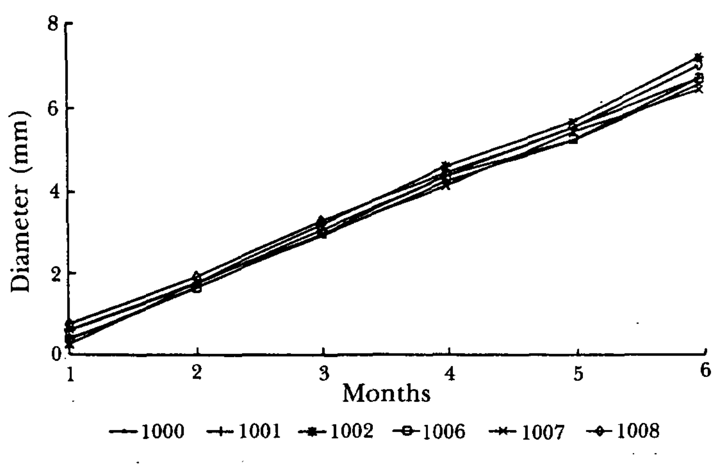

Figure 3. Diameter growth of potted rooted cuttings of *Hopea odorata* from different stock plants (n = 30 per stock plant)

Conclusion

The present study indicates that successful rooting of cuttings of *H. odorata* can be obtained using coppice shoots from pruned stock plants. Using this method of vegetative propagation, a continuous supply of planting stock can be made available for planting programmes.

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