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NOTES

THE EFFECT OF NODAL POSITION AND GENETIC FACTORS ON ROOTING OF *ACACIA MANGIUM* CUTTINGS FROM COPPICE REGROWTH

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Vegetative propagation using stem cuttings is an attractive propagation option for species which show good rooting success rates. Darus *et al.* (1989) achieved a rooting percentage of 71% with cuttings from 6-month-old seedlings of *Acacia mangium* while Wong and Haines (1992) also reported commercially acceptable multiplication rates with seedling cuttings of this species.

Development of an efficient technique for vegetative propagation at Bengkoka, Sabah, was recommended in the "Tree Improvement Programme for *Acacia* at Bengkoka 1992-1994" (Poyry 1992). Some success with small scale trials of seedling material was reported earlier (Lyon & Matuyang 1992, unpublished). However, future work in clonal forestry at Bengkoka will depend on the prospects for operational vegetative propagation from coppice regrowth.

This paper reports on the performance of coppice cuttings at Bengkoka and the effects of genetic differences and nodal position of cuttings on rooting ability. The suitability of cuttings from various nodal positions for inclusion in future vegetative propagation work is evaluated. The need for selection for rooting ability among genotypes to be used as stock plants for a clonal forestry programme is discussed.

The coppice regrowth used was taken from 18 unselected ortets from three locations near the Bongkol nursery, namely Ungkup (UN), Maringgan (MR) and Workshop (WK). All the ortets, which had been cut at a height of 0.5 m, were of unknown origin and their estimated age was 1- 3 y.

Coppice material was cut during early morning and transported to Bongkol nursery for immediate preparation into single node cuttings. All cuttings set were pre-dipped in "Seradix 3" powder, 0.08% IBA (active ingredient: indole butyric acid) and phyllodes were trimmed to 2-3 cm. The methodology for preparation of cuttings is described in SAFODA/JICA (1992). Conditions in the misting house were as follows:

- Shade roofing, 70%, light interception.
- An overhead mist spray irrigation system, misting for 40 s every 30 min, daylight hours only.
- Rooting medium of heat-sterilised, coarse river sand (Kota Marudu), depth 10 cm, base of stones and water overlaying a permeable plastic sheet (fertiliser bags). Supported on a wooden bench with 3 cm gaps between planks to allow rapid through flow of water.
- Temperature of air inside misting house between 24 and 32 °C.
- Wind protection to prevent drying using a transparent plastic surrounding the propagation bed (open at the top).
- Fungicide and insecticide spraying carried out once every two weeks.

Cuttings were labelled for ramet and nodal positions. The number of cuttings set for each genotype varied with availability of material as shown in Table 1.

Daily records were taken of misting house conditions and of mortality of cuttings. Cuttings were considered dead once their phyllodes had fallen and their stems had turned black. After three weeks, cuttings were removed and assessed for root development. Cuttings were assessed as "rooted" if they had produced at least one root longer than 1 cm. Rooted cuttings were transplanted to polybags, with identity maintained. Non-rooted, still-green cuttings were replaced in the sand bed, and rechecked after two weeks.

Of a total of 1982 cuttings set, 46% had rooted after three weeks, 55% after four weeks and 59% after six weeks. After six weeks all cuttings had either died or produced roots. Fourteen of the eighteen genotypes had rooting percentages greater than 50%. The total number of rooted cuttings produced was 1174 (59%) which included all genotypes and nodal positions. A significantly higher rooting percentage of 64% can be achieved by removing data from apical cuttings which performed poorly (Table 2). Furthermore, two of the largest ramets, 10/UN and 15/WK performed particularly poorly (Table 1) and removal of these data reveals a rooting percentage of 69% for non-apical cuttings of the best 16 genotypes.

Table 1. No. of cuttings set and rooting percentages

Number	Identity	No. of cuttings set	Rooting percentage*	Rooting percentage of apical nodes**
1	1/UN	18	67	-
2	2/UN	124	48	21
3	3/MR	49	55	-
4	4/MR	176	78	13
5	5/MR	127	93	76
6	8/UN	50	76	-
7	9/UN	82	54	-
8	10/UN	109	29	0
9	11/UN	99	56	8
10	12/UN	93	38	0
11	13/UN	57	51	-
12	14/UN	28	71	-
13	15/WK	161	27	0
14	16/WK	122	59	6
15	17/UN	135	61	8
16	18/MR	347	65	20
17	19/MR	60	55	0
18	20/MR	145	77	46
Total		1982	59	

Note:
- * Includes data for all nodal positions;
- ** Rooting percentages are not presented where no. of apical cuttings set < 10;

Sites: UN = Ungkup,
MR = Maringgan,
WK = Workshop.

Table 2. No. of cuttings set and percentage rooting for all nodal positions

Nodal position	No. of cuttings set	Rooting percentage
Apex	215	18
First node	470	57
Second node	469	69
Third node	435	70
Fourth node	393	61
Total	1982	59

The large variability between the rooting success for different genotypes is shown in Table 1. The maximum rooting percentage was 93% from the Maringgan genotype (from 127 cuttings set) and the lowest was 27% for the Workshop genotype (from 161 cuttings set). This variation may have been influenced by non-genetic factors such as differing ages of ortet and coppice regrowth. However, even within genotypes from the same location, where such factors would be less important, significant variation in rooting percentage was seen and this is largely attributed to natural genetic variation in rooting ability.

The trial showed a strong relationship between nodal position and rooting percentage. While first, second, third and fourth node cuttings all produced overall rooting percentages in excess of 55%, only 18% of all apical cuttings produced roots (Table 2). Only three genotypes had rooting rates in excess of 20% and seven genotypes failed to achieve 10% (Table 1). Only one genotype produced an apical cutting rooting percentage comparable with that achieved for lower nodes over the whole trial. The greatest success was achieved with second and third nodes which had rooting percentages of 69% and 70% respectively over all genotypes. First and fourth nodes produced acceptable rooting with percentages of 57% and 61% respectively.

Based on the observations of this trial, apical cuttings have a low rooting percentage and should therefore be avoided. Cuttings from first, second, third and fourth nodal positions showed more favourable rooting ability. The low rooting rate for apical cuttings is likely to have arisen from an inability to synthesise plant growth hormones, or low concentrations of stored carbohydrates, or a combination of these factors.

The variation observed between genotypes in this trial agrees with experience elsewhere. Wong and Haines (1992) in their work with *A. mangium* and *A. auriculiformis* seedlings found a variation in multiplication rate for different genotypes, while Haines *et al.* (1992) observed a genetic variability in rooting success with coppice regrowth. Both carbohydrate production and synthesis of growth hormones in coppice are under genetic control to some degree, and these are both likely contributing factors to the variation observed.

This preliminary investigation suggests that variations do exist with respect to rooting ability of genotypes. Hence, this give an indication that selection of genotypes with good rooting ability is possible to start a clonal forestry programme at Bengkoka. However, further research and refinements need to be done before a clonal programme can be fully operational.

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References

DARUS, A., THOMPSON, S. & PIRRIE, A. 1989. Vegetative propagation of *Acacia mangium* by stem cutting: the effect of seedling age and phyllode number on rooting. *Journal of Tropical Forest Science* 2 (4) : 274 - 279.

HAINES, R.J., WONG, C.Y. & CHIA, E. 1992. Prospects for the mass production of superior selection age phenotypes of *Acacia mangium* and *A. auriculiformis*. Pp. 115 - 118 in *Breeding Technologies for Tropical Acacias*. ACIAR Proceedings No. 37.

LYON, P. & MATUYANG, V. 1992. Preliminary observations on the potential for vegetative propagation by cuttings of *Acacia mangium* x *A. auriculiformis* hybrids at Bengkoka. Pp. 55 - 61 in *SAFODA Research Division Annual Report 1992.*

POYRY, G. 1992. *Tree Improvement Programme for Acacia at Bengkoka.* Consultancy for SAFODA, Sabah, Malaysia

SAFODA/JICA (Japanese International Cooperation Agency). 1992. Panduan praktikal tapak semaian bagi spesis *Acacia mangium*. Internal document - SAFODA/JICA, Sabah, Malaysia.

WONG, C.Y. & HAINES, R.J. 1992. Multiplication of families of *Acacia mangium* and *A. auriculiformis* by cuttings from young seedlings. Pp. 112 - 114 in *Breeding Technologies for Tropical Acacias*. ACIAR Proceedings No. 37.