

**Table 1.** Quantitative assessments of *Acacia mangium* trees and their hybrids

Number of tree	<i>Acacia</i> hybrid			<i>Acacia mangium</i>		
	Total height (m)	Diameter at breast height (cm)	Clear bole (m)	Total height (m)	Diameter at breast height (cm)	Clear bole (m)
1	23.4	19.9	13.7	18.2	16.9	14.0
2	23.6	23.7	13.1	19.1	18.1	14.1
3	21.2	21.4	13.4	17.6	16.5	10.9
4	20.7	19.4	9.3	14.8	14.6	9.5
5	22.6	24.3	9.8	16.1	15.2	10.9
6	21.6	19.4	12.0	15.5	13.4	10.2
7	20.6	16.6	12.0	16.4	12.7	8.3
8	18.5	20.1	11.1	16.8	15.3	11.3
9	15.7	14.1	8.1	17.4	16.2	11.5
10	14.6	13.0	9.4	16.7	15.1	8.7
Total	202.5	191.9	111.9	168.6	154.0	109.4
Mean	20.3** ±3.1	19.2** ±3.7	11.2 <sub>ns</sub> ±2.0	16.9 ±1.3	15.4 ±1.6	10.9 ±2.0

\*\* Significant at  $p = 0.01$ ; ns Not significant

We envisage that with proper tree improvement and breeding activities such as selection of superior phenotype trees and proper controlled cross-pollination of these selected trees, better quality *Acacia* hybrids can be produced in the future.

Enhanced with the application of biotechnology, such as tissue culture, *Acacia* hybrids may be available for large scale planting sooner than expected.

### Acknowledgements

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### References

- RUFELD, C.W. 1987. Quantitative comparison of *Acacia mangium* Willd versus hybrid *A. auriculiformis*. FRC Publication 40. 20 pp.

## A NOTE ON THE ERADICATION OF *ACROSTICHUM AUREUM* FERNS IN THE MATANG MANGROVES, PERAK, PENINSULAR MALAYSIA

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*Acrostichum aureum* is a common mangrove fern that grows rapidly after mangrove forests have been clear felled for timber. It often forms extensive dense thickets of about 3 to 4 m height particularly in the more elevated inland areas which are less frequently inundated by tides.

In the Matang mangroves, these thickets are removed by the Forestry Department as a routine site preparation treatment prior to planting of *Rhizophora* in logged over areas. In the 1970s, eradica-

tion was undertaken by uprooting the rhizomes using a wedged iron bar. This method was found to be laborious. In the 1980s, eradication trials by foliar spraying the fern using a herbicide called Hexazinone (trade name: Velpar 90) was found to be effective. Since then, the chemical method has replaced the manual method. Velpar 90 costs US\$ 56 kg<sup>-1</sup> and usually 3 to 5 kg are required to treat a hectare of fern (40 - 70% coverage). The total cost of treatment usually varies from US\$ 256 to 352 ha<sup>-1</sup> (Perak Forestry Department unpublished). In areas which are completely infested with the fern, as much as 10 kg of Velpar 90 are used and this costs about US\$ 644 ha<sup>-1</sup>.

In November 1988, a trial aimed at developing a more cost effective technique of eradicating *A. aureum* was carried out in a forest site fringing the compound of the Matang District Forest Office. A 5 × 40 m strip, completely covered with dense *A. aureum* thickets of 3 to 4 m height was cleared using a saw-edged disc brush cutter. Within the cleared strip, a row of nine 4 × 4 m plots were established. A month later, all new fronds that sprouted in Plots 3, 5 and 7 were sprayed with Velpar 90

(concentration: 5.5 g l<sup>-1</sup> of water) while all rhizome growth apices in Plots 1, 4 and 9 were manually excised using a chisel. Plots 2, 6 and 8 were left as control.

An examination in January 1989 indicated that the average percentage of rhizomes having new fronds was 100% for the control plots, 6% for the chemically treated plots and 60% for the manually treated plots (Table 1). Another examination in March 1989 showed that the average percentage of rhizomes having new fronds had declined to only 3% for the chemically treated plots while that the manually treated plots had increased to about 64%.

For the chemically treated plots, most of the rhizomes were killed through downward translocation of Velpar 90 via the sprayed newly sprouted fronds. For the manually treated plots, most of the rhizomes are able to produce new growth apices from which new fronds emerged.

From this preliminary trial, it can be seen that Velpar 90 is an effective herbicide in eradicating *A. aureum* while the manual method of excising rhizome growth apices is not effective. The technique of removing the fronds using a brush cutter

Table 1. The effects of chemical and manual treatments on *Acrostichum aureum*

Treatment	Plot	Number of rhizomes initially	Number of rhizomes having new fronds		Regrowth (%)	
			Jan. 89	Mar. 89	Jan. 89	Mar. 89
Control	2	27	27	27	100.0	100.0
	6	21	21	21	100.0	100.0
	8	26	26	26	100.0	100.0
Chemical	3	35	1	0	2.9	0.0
	5	15	1	0	6.7	0.0
	7	33	3	3	9.1	9.1
Manual	1	23	15	17	65.2	73.9
	4	40	23	24	57.5	60.0
	9	14	8	8	57.1	57.1

**Table 2.** Cost breakdown for eradicating a hectare of *Acrostichum aureum*

Activity	Cost (US\$)
Labour for brush cutting all <i>A. aureum</i> fronds (10 man-days)	40.74
Fuel for brush cutter	13.33
Labour for spraying all new fronds that sprouted (5 man-days)	20.37
Velpar 90 (2 kg)	111.11
Total cost $ha^{-1}$	185.55

followed by spraying Velpar 90 on newly sprouted fronds (a month later) uses only 2 kg of herbicide and the treatment costs about US\$ 185  $ha^{-1}$  for areas completely covered with the fern (Table 2). The above technique is recommended as it requires less herbicide for spraying the newly sprouted fronds compared to spraying

mature fronds, as currently practised in Matang. There is however a need to repeat this trial on a larger scale so that the total cost incurred in using Velpar 90 as prescribed above can be more accurately estimated. More importantly is the need to develop silvicultural techniques of rehabilitating *A. aureum* areas without having to resolve to herbicides for site treatment.

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