The results of this experiment indicate that the graft union as well as speed of the healing process depend on species used (Table 1). The combination of two seedlings of the same species such as *D. baudii, A. angustiloba, G. arborea, A. mangium, S. parvifolia, S. leprosula* and *S. roxburghii* produced good and excellent graft unions. At one year after planting, the grafted unions of these seedlings were still intact and the growth performance was faster and better compared to their normal single root seedlings. For example, the *D. baudii* seedling with a double root system grew faster and produced more and bigger leaves compared to the normal seedling (Figure 1).

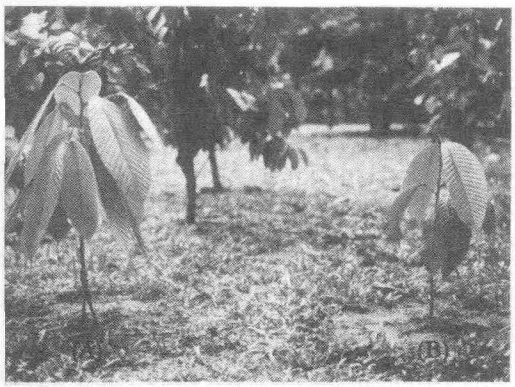

Figure 1. Eight-month-old *Dipterocarpus baudii* seedling with double root system (A) in comparison to its normal seedling of the same age (B)

The most interesting finding here was the success of a splice approach grafting on two different species like *S. leprosula* and *S. assamica, S. leprosula* and *S. parvifolia, M. atropurpurea* and *I. palembanica, S. assamica* and *A. mangium, S. assamica* and *E. cyclocarpum,* and *S. leprosula* and *E. cyclocarpum.* However, the graft unions of two different species were very poor and were split at three to four months after planting on the ground. This may be due to the slow or less callus formation which is necessary for healing of the union. There are some species in which the graft union did not contact each other even four months after grafting. For example, *E. cyclocarpum* with two *Shorea* species, such as *S. leprosula* and *S. parvifolia* and between *A. mangium* and *Hopea odorata* seedlings.

In conclusion, we are very positive that the slice approach grafting technique within the dipterocarp species and between dipterocarps and nitrogen fixing trees can be easily carried out. This may induce faster growth in a slow growing dipterocarp and produce timber trees with strong rooting systems.

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DO COPPER CHROME ARSENIC (CCA) TREATED KEMPAS PILES MEET MALAYSIAN STANDARDS?

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The Malaysian Standard MS 822:1983 (Anonymous 1983a) specifies a minimum Dry Salt Retention (DSR) of 16 *kg* m^3 for CCA treated piles. Commercially treated

kempas (*Koompassia malaccensis*) piles which had received certification from the Standards and Industrial Research Institute of Malaysia (SIRIM) were tested by, the Wood Preservation Analytical Laboratory, Forest Research Institute Malaysia. These piles were meant for a building project in FRIM.

Nineteen charges of the CCA-treated piles (at the cross-cut) size of 150 × 150 *mm* were tested qualitatively according to the Malaysian Standard MS 833:1984 (Anonymous 1984) and the procedure recommended by the Timber Preservative Authority of New Zealand (Anonymous 1980). The average number of piles per charge was around 100 pieces. The samples for analysis were in the form of plugs (10 *mm* diameter) taken at 25 *mm* beneath the surface and at least 900 *mm* away from both ends of the timber pile (Anonymous 1983a). The samples which responded positively to Chrome Azurol- S reagent (by the change of colour from red to royal blue) were marked for further quantitative tests according to the Malaysian Standard MS 821:1983 (Anonymous 1983b).

The results of chrome azurol-S test for the treated piles were very disappointing with only four charges having 50 or more piles giving positive results (Table 1). Detailed quantitative tests showed that the smallest number of piles per charge with the minimum DSR was two pieces (charge 7) and the highest was only 42 pieces (charge 16).

Apart from low number of piles with the minimum DSR, the amount of individual salts in the treated piles also varied significantly from one charge to another. Some charge contained more arsenic salt in the pile whereas others had more chromium salt. The fluctuation in the individual salt content adversely affected the DSR value and the fixation of the chemical after penetration into the wood (Suzuki *et al.* 1981).

Table 1. The dry salt retention (DSR) (*kg* m^3) at 25 *mm* beneath the surface of treated kempas determined by atomic absorption spectrophotometer

Charge number	Number of piles tested positive with chrome Azurol-S	Mean wood density (*kg* m^3)	Mean DSR (*kg* m^3)	Number of piles with DSR > 16 *kg* m^1
1	23	848	13.8	9
2	37	866	13.7	11
3	30	859	11.9	26
4	34	839	14.4	8
5	33	843	14.4	9
6	56	842	14.0	19
7	30	833	12.6	2
8	19	849	15.1	9
9	41	846	15.7	20
10	25	826	17.8	17
11	42	851	16.2	23
12	58	862	10.2	11
13	60	859	11.9	15
14	27	825	21.5	24
15	47	876	16.8	26
16	52	821	20.4	42
17	17	873	15.5	5
18	13	822	19.2	10
19	30	872	32.4	30

Based on the low number of piles containing the minimum value of DSR, the quality of the treated piles was clearly below specification. As a result, the piles were rejected in favour of the more expensive concrete piles for the building project.

From the above findings, we urge SIRIM and authorities connected with the industry to review the issue of certification of treated piles in Malaysia. There is also a need to review the penetration and loading of kempas with CCA so as to come up with a more realistic level related to end use.

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ANNOUNCEMENTS

FOURTH INTERNATIONAL MYCOLOGICAL CONGRESS

DATE: AUGUST 28 - SEPTEMBER 3, 1990

VENUE: REGENSBURG, FEDERAL REPUBLIC OF GERMANY

Contact:
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