NOTES

PRODUCTION OF CLUSTERING *ROTAN MANAU* (*CALAMUS MANAN*) STOCK PLANTS

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In Malaysia, rattans from the natural forests are being depleted rapidly as a result of over-exploitation. So, an interest in artificial planting is developing rapidly. But, there is a seed shortage and it is costly (about US$ 0.70 per *kg* of seeds in 1989). This can be overcome via tissue culture techniques. The *in vitro* propagation of rotan manau (*Calamus manan*) is being developed at the Forest Research Institute Malaysia (FRIM).

In nature, *rotan manau* is solitary stemmed and clustering is a rare phenomenon. Naturally clustering manau has been observed in south Kalimantan (Dransfield 1979) and in trial plots at Hulu Langat and Bukit Lagong Forest Reserves in Selangor (Manokaran 1981). However, the frequency was very low, approximately less than 3% of the total population. In *in vitro* propagation, plantlets are produced either by the callus formation method or the shoot proliferation method (Aziah *et al.* 1985, Aziah & Salmiah 1986). By using the latter method, clustering *C. manan* planting stocks were produced. The success in the production of clustering *C. manan* will be extremely useful in its silviculture.

In the production of clustering *C. manan* planting stocks, the collar region explants of the aseptically germinated seedlings were used. Multiple shoot formations were obtained in Woody Plant Medium (WPM) (Lloyd & McCown 1980) supplemented with 3% (w/v) sucrose, 0.5% (w/v) Bacto-agar and 2.3 *mg/l* BAP (Benzyl aminopurine) within a month of initiation (Figure 1). At two months of age, these multiple shoot structures were subcultured onto fresh medium of similar composition. During the subculturing stage, the clusters were divided into two to four small clumps, depending on the size. It was demonstrated that this method has a greater potential for micropropagation of clustering *C. manan* stock plants.

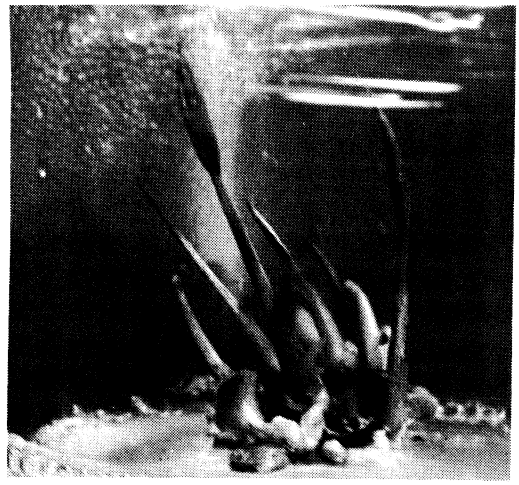

Figure 1. Induction of multiple shoots of *Calamus manan* from the collar region explant

Induction of roots in the clustering *C. manan* was done under *in vivo* conditions. They were first treated with a commercial hormone rooting powder (Seradix 3) and then planted into plastic boxes (14 X 38 X 60 *cm*) containing an equal proportion of soil and sand mixture. Prior to covering with plastic sheath, the clusters were watered excessively to maintain high air humidity during the rooting process. After a month, some of the clusters developed roots and were immediately potted into black polybags containing a mixture of two parts sterile forest soil, two parts sterile sand and one part forest top soil.

It was found that the clustering *C. manan*

stock plants have several advantages compared to a single rooted plantlet: (1) they produce a faster and a higher rooting percentage; (2) they give a higher survival rate after potting into polybags; and (3) they are easier to handle during the subculturing process.

Future work will be directed towards the study of the competition among the shoots within the clusters and on the induction of increased number of shoots per cluster.

References

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A NOTE ON TREE SPECIES AND PRODUCTIVITY OF A NATURAL DRYLAND MANGROVE FOREST IN MATANG, PENINSULAR MALAYSIA

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Dryland mangroves denote the final stage of mangrove forest succession and the transition to inland forests. They are often found at the landward side of mainland mangroves or in the interior of island mangroves and are only occasionally inundated by exceptional or equinoctial tides (Watson 1928).

In the Matang mangroves, Perak, Peninsular Malaysia, the extent of dryland mangroves was reported to be about 2,205 *ha* or 5.3% of the total area (Haron 1981). Under Matang Mangrove Forest Working Plan (1980 - 1989), dryland mangroves have been classified as unproductive forests (Haron 1981).

A survey was undertaken to determine the species composition and productivity of this mangrove forest type. Nine (50 X 50 *m*) plots were randomly established within a natural dryland mangrove in compartment 84 of the Matang Mangrove Forest Reserve. All trees $\geq$5 *cm* dbh in each plot were tagged, identified and measured for their dbh.

A total of 2,012 stems belonging to 30 species and 24 genera was recorded (Table 1). Very common and widespread species (> 100 stems ha^{-1} and found in all plots) are *Rhizophora apiculata, Heritiera littoralis* and *Ficus microcarpa*. Common species (50-100 stems ha^{-1}) are *Flacourtia jangomas, Oncosperma tigillarium, Bruguiera gymnorrhiza* and *Teijsmanniodendron hollrungii*.

R. apiculata and *B. gymnorrhiza* are com-