# NOTES

## A NOTE ON THE GROWTH OF *CALAMUS MANAN* SEEDLINGS FOLLOWING FERTILISATION

**Aminah Hamzah & Mohd. Afendi Husin**

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

Very few reports are available on proper fertiliser regime for rattan seedlings at the nursery stage. H. L. Voon (unpublished) used three to four granules of NPK yellow (15:15:6:4) to promote the growth of rattan seedlings in the nursery. Tan (1988) mentioned that the application of five granules per seedling of the NPK (15:15:15) compound fertiliser at two weeks after transplanting and then increased to 15 to 20 granules per seedling when the seedlings reached nine to ten months old would help to produce healthy and vigorous seedlings. However no survival counts were mentioned in the above reports.

Besides the visual judgement for rating the good quality of potted seedlings produced, shoot-root ratio was often used as an alternative criterion (Liegel & Vernator 1987).

The aim of this experiment was to develop the fertiliser regime for *Calamus manan* potted seedlings so that good quality seedlings with high survival could be produced from the nursery.

Germinated seedlings of *C. manan* were transplanted into black polythene bags (9 *cm* diameter × 17 *cm* height) before their primary leaves were opened. The potting medium consisted of one part sand and three parts forest top soil. Ground magnesium limestone was added to the potting medium at the rate of 1.6 $kg\ m^3$ to increase the pH level to approximately 6.3.

Three types of compound fertiliser were used with seven levels of application.

Types of fertiliser:

1) Self prepared NPK mixture, 42:46:27 ($N:P_2O_5:K_2O$)
2) Commercial NPK yellow, 15:15:6:4 ($N:P_2O_5:K_2O:MgO$)
3) Commercial NPK blue 12:12:17:2 + TE ($N:P_2O_5:K_2O$: MgO + TE - trace element)

Application levels:

0.5, 1.0, 1.5, 2.0, 3.0, 4.0, and 5.0 g/plant/pot

The experimental set up was a completely randomised design with 3 × 7 factorial combinations replicated three times. Each treatment consisted of ten seedlings per replicate and a total of 630 seedlings were used.

Initially, fertilisation was carried out one week after transplanting. Successive applications were made every two months until the seedlings reached the age of eight months. Throughout the experiment, seedlings were kept under Tildenet with 50% light intensity. The plants were watered twice a day, in the morning and late afternoon.

Final observation was made at ten months of age. Survival counts and dry matter weight were taken. For the dry matter measurement, the shoot and root of each seedling of every treatment were separated and the potting medium around the roots were removed and cleaned. The shoot and root were then dried in oven at 50°C for 48 *h* after which their dry weights were taken.

### Percentage of survival

Analysis of variance on survival percentage showed that there was no interaction between types and levels of fertilisers used. No significant difference was obtained between the three types of fertiliser

used (Table 1). This was further confirmed using Student Newman-Keuls test (SNK). This indicated that different types of fertiliser did not affect the survival of *C. manan* seedlings.

**Table 1.** Analysis of variance for the mean % of survival

| Source of variation | df | Mean square | F-value |
|---|---|---|---|
| Fertiliser types (T) | 2 | 239.68254 | 1.58ns |
| Fertiliser levels (L) | 6 | 6076.71958 | 40.08** |
| T × L | 12 | 143.38624 | 0.95ns |
| Pooled residual | 54 | 151.61670 | |
| Total | 62 | - | |

Correlation coefficient (r) = 0.90475
Coefficient of variation (cv) = 15.99456

** - significant at 1 % level
ns - not significant

The levels of fertilizer were highly significant (Table 1). SNK test showed that the first four levels (0.5, 1.0, 1.5 and 2.0 *g*) did not significantly affect the survival of the seedlings. The other three levels (3.0, 4.0 and 5.0 *g*) significantly decreased their survival (Table 2).

**Table 2.** Student Newman-Keuls test for mean % of survival by fertiliser level

| Fertilizer level (*g*) | Mean % of survival |
|---|---|
| 0.5 | 98.89 a |
| 1.0 | 96.67 a |
| 1.5 | 94.44 a |
| 2.0 | 93.33 a |
| 3.0 | 70.00 b |
| 4.0 | 53.33 c |
| 5.0 | 32.22 d |

Means with the same letter are not significantly different at the 1% level of significance

It was also observed that seedlings receiving higher levels of fertiliser were susceptible to pests and disease attack which could also lead to the death of seedlings when compared to those receiving lower levels. Similar results were obtained by Sundralingam (1982) on *Tectona grandis* seedlings.

## Shoot-root ratio

Further statistical analysis on the shoot-root ratio was carried out on level 0.5 to 2.0 *g* to see the quality of seedlings produced.

Analysis of variance on shoot-root ratio showed that there was no significant difference on the interaction between the types and levels of fertilisers used. However, highly significant results were obtained on the type and fertiliser level individually (Table 3).

**Table 3.** Analysis of variance of mean shoot-root ratio

| Source of variation | df | Mean square | F-value |
|---|---|---|---|
| Fertiliser types (T) | 2 | 0.215175 | 7.43 ** |
| Fetiliser levels (L) | 3 | 0.153662 | 5.30 ** |
| T × L | 6 | 0.030012 | 1.03 ns |
| Pooled residual | 30 | 0.028971 | |
| Total | 35 | | |

Correlation coefficient (r) = 0.71155
Coefficient of variation (c.v) = 9.22129

** - significant at 1% probability level
ns - not significant

On the shoot-root ratio, SNK test showed that fertiliser type 1 differred significantly from type 3 (Table 4). Highest mean shoot-root ratio was obtained with fertiliser type 1 followed by type 2 and type 3. Fertiliser level 2.0 *g* was highly significant

from 0.5 and 1.0 *g* (Table 5). Mean shoot-root ratio decreased as the level of fertiliser decreased.

**Table 4.** Student Newman-Keuls test for mean shoot-root ratio by fertiliser type

| Fertiliser type | Mean shoot-root ratio |
|---|---|
| 1 (Self prepared) | 1.9758 a |
| 2 (NPK yellow) | 1.8533 ab |
| 3 (NPK blue) | 1.7083 b |

**Table 5.** Student Newman-Keuls test for mean shoot-root ratio by fertiliser level

| Fertiliser level (*g*) | Mean shoot-root ratio |
|---|---|
| 2.0 | 2.0078 a |
| 1.5 | 1.8956 ab |
| 1.0 | 1.7478 b |
| 0.5 | 1.7322 b |

Means with same letter are not significantly different at the 1% level of significance

The mean shoot-root ratio obtained in this experiment was still in the acceptable range. Liegel and Vernator (1987) stated that shoot-root ratio of 2 was acceptable for most seedlings. Higher ratios usually indicated excessive shoot growth which would lead to less sturdy seedlings produced.

Based on the results of this experiment, potted seedlings of *C. manan* raised in the nursery could be fertilised with any three different types of these fertilisers namely self prepared NPK mixture or NPK yellow or NPK blue obtained commercially to improve their survival and quality.

The recommended levels are between 0.5 to 2.0 *g* per seedling applied every two months. Mean shoot-ratio between these levels ranged from 1.7 to 2.0. NPK blue and lower levels of 0.5 to 1.0 *g* would give smaller ratio than other fertiliser types and levels respectively.

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# A NOTE ON A LABORATORY METHOD FOR ESTIMATING DURABILITY OF SOME TROPICAL HARDWOODS

**L. T. Hong**

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

**&**

**K. Yamamoto**

*Forestry and Forest Products Research Institute, P. O. Box 16, Tsukuba, Norin Kenkyu Danchi-Nai, Ibaraki, 305 Japan*

The natural durability of timbers is determined from data obtained through field trials by long term exposure of the timbers to biodegrading organisms in the