

## Influence of Light on Seed Germination of *Calamus manan*

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### ABSTRAK

Biji benih rotan manau yang baru dikutip telah ditanam di dalam tiga keadaan cahaya yang berbeza a) kawasan lapang b) bawah naungan atap c) di bawah silara yang padat. Pada 2, 4 dan 6 bulan berselang, biji benih yang berada di bawah naungan (b) dan (c) dipindahkan ke kawasan lapang. Percambahan dalam semua percubaan berlaku dalam tempoh 28 hari dari mula ditanam dan berakhir hingga hari ke 54. Pada keadaan kawasan lapang dan bawah atap, peratus percambahan mencapai 50% dalam masa 6 minggu. Manakala dalam keadaan di bawah naungan hutan, peratus percambahan tidak mencapai 50%. Keputusan daripada penyelidikan ini menunjukkan yang pengaruh cahaya seolah-olah tidak memberi kesan ke atas daya cambah rotan manau.

### ABSTRACT

Freshly collected seeds of *Calamus manan* were sown under three different light conditions: (a) in the open (b) under moderate shade of "attap" roofing and (c) under intact forest canopy. At 2, 4 and 6 month intervals, the samples that had been sown under shade ((b) and (c)) were moved into the open. Germination under all treatments occurred day 28 from sowing and was completed by day 60. Under open and attap condition, the cumulative germination percentage achieved 50% by about 6 weeks. Under forest, the cumulative germination percentage did not reach 50%. The results indicate that although the seeds appear insensitive to light regimes for germination, some amount of light (attap conditions) optimizes germination of *Calamus manan*.

**Key words :** *Calamus manan*, germination, light requirements.

### INTRODUCTION

Rattans, presently a minor forest produce, have become increasingly important in recent years, fetching good prices in western countries. The most important of the rattan species is *Calamus manan* - a big diameter cane mainly used in the furniture industry (Dransfield 1979). Research on this species has been well covered by many researchers in this region (Kong and Manokaran 1986). However, no research has been conducted on light requirement in seed germination for seedling establishment. Mori (1980) has mentioned that *Calamus manan* requires about 50% Relative Light Intensity (RLI).

The natural regeneration of this species has not been studied but from observations, seedlings do grow well in areas where canopy is relatively open (Manokaran 1977). Whether the existence

of seedlings in such areas is due to the presence of a reservoir of dormant viable seeds in previously undisturbed or shaded forest soil (Liew 1973) or to the rapid seeding-in of species (Whitmore 1975), is a question which cannot be adequately resolved by just examining the virgin forest soil for propagules and their successful germination. In addition, neither does it indicate the length of time that the seeds have been lying in the soil (Aminuddin and Ng 1982). This study is mainly aimed at one of the many factors that influence seed germination, i.e to study the influence of light on seed germination of *Calamus manan*.

### MATERIALS AND METHODS

The design of this experiment was based on an approach followed by Vasquez-Yanes (1976). Three hundred and fifty seeds, cleaned as per

standard nursery practice (Johari and Che Aziz 1981), were sown in germination boxes, each containing 50 seeds, making a total of seven boxes. Sowing technique, medium and condition was similar to the method used by the nursery at the Forest Research Institute Malaysia (FRIM). One box was placed in the open (100% RLI) and of the remaining 6 boxes, 3 boxes each were placed under 'attap' - i.e. palm leaf material used as roofing - and forest condition. Light intensity under attap ranged between 10% - 20% RLI while in the forest, the RLI was less than 1% at midday. Light values were measured using a luxmeter.

At intervals of 2, 4 and 6 months, one germination box each from attap and forest condition was transferred to the open. A seed was considered germinated when any part of the embryo become visible 'above ground'. The progress of germination was observed and recorded daily.

The calculated parameters used were cumulative germination percentage (CGP), germination capacity (GC) and energy period (EP). The definitions for GC and GE are as follows:

- (i) GC is the total number of seeds that germinate in the test plus the number of sound seeds remaining ungerminated at the end of the test, expressed as a percentage.

$$GC = \frac{\text{No. of germinated seeds} + \text{No. of sound ungerminated seeds}}{\text{Total no. of seeds.}} \times 100$$

- (ii) G.E. is the percentage of seeds in a sample that have germinated in the test up to the time when the rate of germination (i.e. the number of seeds germinating per day) reaches its peak. The number of days required to reach this peak is the Energy Period (EP).

$$GE = \frac{\text{Summation of germinated seeds from the first day of germination to the day germination peaks}}{\text{Total number of seeds}} \times 100$$

## RESULTS

The CGP of *C. manan* under different environmental conditions is shown in Fig. 1.

Germination under all treatments occurred between Day 28 and Day 60 after sowing. Percentage germination was highest for seeds placed under attap (71%) as compared with open (53%) and forest shade conditions (34%) (Fig. 1). Under attap condition period, 50% germination was at 6 1/2 weeks while in the open at 7 weeks. In the forest, CGP did not reach 50%.

No further germination was observed when germination boxes under attap and forest shade conditions were transferred out into the open at 2, 4, and 6 months after sowing.

The CGP, GP, GC, GE and EP are tabulated below (Table 1).

TABLE 1  
Germination parameters monitored for *C. manan* under open, attap and forest conditions.

Parameters	Open	Attap	Forest
i) CGP (%)	53	71	34
ii) GP (wk)	4 - 7	4 - 8	5 - 7
iii) GC (%)	63	88	48
iv) GE (%)	12	24	19
v) EP (days)	36	31	38

(CGP = cumulative germination percentage, GP = germination period, GC = germination capacity, GE = germination energy, EP = energy period)

Attap (10% - 20% RLI) provides the best condition for germination followed by open area (100% RLI). Germination under forest condition (<1% RLI) was poorest. Attap condition was the best for all germination parameters. The CGP was highest under attap condition (71%) followed by open (53%) and forest (34%).

## DISCUSSION

Light seems to have little influence on the germination capability of *C. manan* since it can occur practically over all ranges of light intensity (between <1% to 100% RLI). Germination, however, occurs best under some shade, that is, 10% to 20% RLI (attap condition). Under very low light (forest condition) germination is much more depressed compared to the open. It is

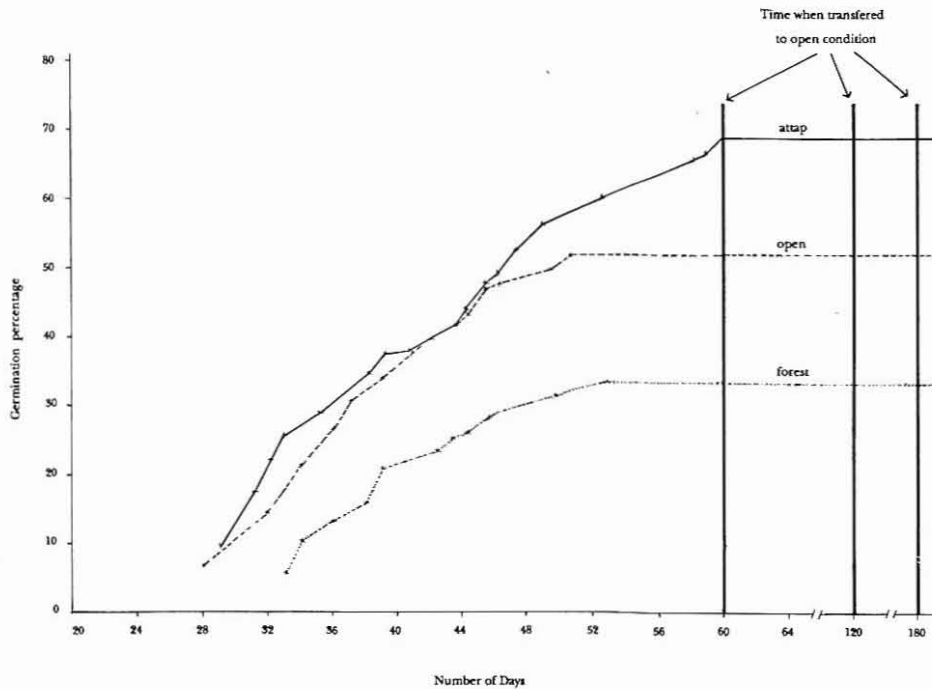


Fig. 1: Cumulative germination percentage of *Calamus manan* under open, attap and forest condition.

possible that under forest conditions, seeds deteriorate faster as observed by Aminuddin and Ng (1982).

The fact that no further germination of *C. manan* seeds occurs following transfer from shade (attap and forest conditions) to the open suggests that the species may not have a seed 'dormancy' that is influenced by light. However, from the above study, some inhibition does occur under low light (forest condition) intensity and with increased light intensity (attap condition), germination seems to improve by 37%. With further increase in RLI (open condition), germination is inhibited by 18%. This suggests that some light is necessary to overcome 'dormancy' - i.e. germination percentage is increased although at higher RLI (open), it may inhibit to some degree. It does appear that *C. manan* does not have a germination strategy unlike some species which display seed dormancy that is controlled by the light climate (Corner 1966; Aminuddin and Ng 1982).

**CONCLUSION**

From the above study, it is evident that although the seeds are not sensitive to light regimes, some

amount of light appears essential to optimize germination in *Calamus manan*.

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