GERMINATION OF *TECTONA GRANDIS* PROGENIES DURING NURSERY STAGE

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Teak (*Tectona grandis*), a member of the Verbenaceae family, occurs naturally within the latitudes of 10° and 25 °N covering the Indian subcontinent and the mainland of Southeast Asia, including Myanmar, Thailand, Cambodia and Laos. However, it is absent in Vietnam, Malaysia and Borneo island. Even though teak thrives well in Java island and certain islands in the Indonesian Archipelago, the origin of the species is disputed; it is not considered a native species but suspected to be introduced to the islands from the Hindu kingdoms (Altona 1924). Teak wood is one of the most expensive and durable timbers and is attractive in terms of its colour and texture, suitable for all kinds of household constructions, easy to work with and carve, and resistant to termites, fungi and weather (Subramanian 1997).

In Malaysia teak cultivation is relatively new compared with neighbouring countries like India, Myanmar, Thailand and Indonesia. Planting of the species is preferred to ensure sustainable supply of the raw wood materials. A number of research projects have been formulated to strengthen the gaps in the technical knowledge of this species. This paper, reports on the germination trial and growth performance of selected progenies during nursery stage.

Teak fruits were collected from 34 teak plus trees growing at the plantation in Mata Ayer Forest Reserve, Perlis, Peninsular Malaysia. The plus trees were evaluated based on their overall superiority in several important characteristics such as stem straightness, diameter at breast height (dbh), clear bole and total height, crown size and shape, branch angle and size of stem roundness. Besides these characteristics, the evaluation has also taken into account the occurrence of forking, pest and disease infections as well as the ability to produce large amounts of seeds.

In February 2000, a total of 52 kg mature teak fruits were collected from these plus trees. The fruits were treated using benlate fungicide and kept in a cold room at a temperature of 18 °C for six months. All the fruits were then sown in the nursery in August. It is well accepted that germination of teak seed is poor and sporadic which are caused by its dormancy behaviour (Kaosa-ard 1995). Under nursery conditions, the germination of untreated seeds is very low (Gartner 1956, Kumaravelu 1993). In this study, fruits were treated by soaking them for 12 hours in water followed by drying under the sun for 12 hours for three consecutive days prior to sowing. The treated fruits were then sown in germination trays and placed in an open area under direct sunlight. The germination percentage and number of seeds germinated per fruit were assessed daily for a month. The germination percentage was calculated based on the number of germinated fruits. In addition, the number of seeds per fruit that germinated was also calculated.

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Results showed that the seed germination percentages varied significantly among the plus trees. The germination percentages ranged from 2 to 74% with an average of 34.8% (Table 1). This result is similar with the finding by Kadambi (1957) who showed that seeds exposed to the sun gave 38% germination. The author's work, however, was done from a general collection and not from selected superior trees. It is, therefore, very difficult to associate seed germination with tree vigour. We also observed that the 34 tested plus trees could be grouped into two groups in terms of their germination ability; 13 individuals were found to give more than 50% germination while another 11 individuals produced less than 20% germination. The low mean germination percentage in this study (34.8%) was, therefore, due to this big difference between the two groups. The lower germination percentages (less than 10%) were from families T1, T4, B45 and B52 while the highest germination percentage was from the family T5 (74% germination). The information generated here is important in setting up seedling seed orchard (SSO) or seed production area (SPA) especially since the seed production capacity of both SPA and SSO is relatively poor (Kaosa-ard 1979, Tewari 1992).

Table 1 Seed germination behaviour of teak plus trees from Mata Ayer Forest Reserve

Family	Germination (%)	Percentage of seed germinated per fruit			
		One-seed	Two-seed	Three-seed	Four-seed
B105	64	64.1	28.1	7.8	0.0
B27	35	60.0	25.7	11.4	2.9
B29	21	81.0	19.0	0.0	0.0
B45	4	75.0	25.0	0.0	0.0
B47	23	82.6	17.4	0.0	0.0
B49	14	92.9	0.0	7.1	0.0
B52	5	80.0	20.0	0.0	0.0
B73	53	71.7	28.3	0.0	0.0
B74	51	68.6	29.4	0.0	2.0
B75	65	58.5	30.8	9.2	1.5
B78	55	74.5	21.8	3.6	0.0
B80	14	71.4	21.4	0.0	7.1
B81	19	73.7	21.1	5.3	0.0
B83	32	31.3	37.5	25.0	6.3
R1	27	74.1	25.9	0.0	0.0
R3	51	62.7	35.3	2.0	0.0
R4	19	94.7	5.3	0.0	0.0
R5	60	60.0	35.0	5.0	0.0
R6	15	73.3	26.7	0.0	0.0
R7	13	76.9	23.1	0.0	0.0
T	14	85.7	14.3	0.0	0.0
T1	2	100.0	0.0	0.0	0.0
T10	53	66.0	30.2	3.8	0.0
T13	30	76.7	23.3	0.0	0.0
T16	72	63.9	25.0	9.7	1.4
T17	69	71.0	27.5	1.4	0.0
T18	31	71.0	19.4	9.7	0.0
T19	20	75.0	25.0	0.0	0.0
T32	69	78.3	17.4	4.3	0.0
T33	24	79.2	20.8	0.0	0.0
T4	9	44.4	55.6	0.0	0.0
T5	74	68.9	28.4	0.0	2.7
T7	59	57.6	32.2	6.8	3.4
T9	17	88.2	11.8	0.0	0.0
Mean	34.8	72.1	23.8	3.3	0.8

Table 1 also shows that, on the average, 72.1% of the germination occurred in the one-seed fruit, while 23.8% from the two-seed and 3.3% from three-seed fruit. Only 0.8% of the germination came from the four-seed fruit. These rates are comparable with the findings by Khushalappa (1977) in Thailand. Generally, almost all fruits from the plus trees gave a good percentage of germination with one or two seeds from a fruit compared with three or four seeds. This entire phenomenon gives the advantage of increasing the number of seedlings that could be produced from a fruit.

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