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INFLUENCE OF AGE OF MOTHER TREE ON GERMINATION AND INITIAL VIGOUR OF NEEM (*AZADIRACHTA INDICA*)

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Neem (*Azadirachta indica* A. Juss) is a native tree of the Indio-Pakistan subcontinent, with multifarious uses (Kumaran *et al.* 1994). Presently, India is the largest producer of neem seeds in the world, mostly from Tamil Nadu, Uttar Pradesh and Karnataka (Shankarabhat *et al.* 1998). Neem is normally propagated from seeds, either sown directly or raised in a nursery and transplanted as seedlings. Several problems are associated with neem seeds such as poor germination, short viability after harvest and poor storability (Ponnuswamy *et al.* 1991). There is some evidence that the age of the mother tree influences seed and seedling attributes (Olsen 1932, Swaminathan *et al.* 1994). If true, tree scientists need to know the optimum age of the tree for seed collection and effective seedling production. We tested the hypothesis that the age of the mother tree in neem has a similar effect on seed quality and seedling vigour.

Neem fruits were collected from 5-, 10-, 15-, 20-, 25- and 30-y-old trees at the Agricultural Engineering College and Research Institute, Kumulur, and adjoining Pallapuram village (10° 4' N, 78° 3' E, 70 m above sea-level) during July 1997. In each age group seeds were colleged from five trees and pooled. The greenish-yellow fruits were separated (Bharathi *et al.* 1996), the seeds extracted by soaking the fruits in water for 24 h and the fruit wall and fleshy mesocarp removed by hand and repeated washing with water. The seeds were dried in the shade at ambient temperature (32 °C) for 96 h by spreading them on zinc trays. Germination test was conducted with 4 replications of 50 seeds adopting the sand method at 25 °C and 90% relative humidity in the seed germinator. Seed germination was counted after sowing for 21 days and expressed as germination percentage (International Seed Testing Association 1985). For the estimation of dry matter production, 10 seedlings were selected randomly and kept in an oven at 85 °C for 24 h after measuring their root and shoot lengths. The vigour index was derived from the formula of Abdul Baki and Anderson (1973):

$$VI = \text{percentage germination} \times \text{total seedling length (cm)}$$

The data recorded were subjected to analysis of variance using completely randomised design (Panse & Sukhatme 1967) and tested for significance of variance at $p = 0.05$. Percentage values were transformed into arc sine values prior to statistical analysis and the mean values of the experiment were compared using Duncan's multiple range test (Gomez & Gomez 1984).

The neem seeds collected from the 20-y-old trees recorded the highest germination percentage of 88.2%, followed by the seeds collected from the 15-y-old trees at 80.6% (Table 1). The lowest germination of 60.8% was recorded by the seeds collected from the 25-y-old trees. The seedlings took 7 to 10 days to emerge, with the shortest 7.5 days taken by the seeds collected from the 20-y-old trees. The highest root length of 12.4 cm was recorded from seeds collected from the 10-y-old trees. As the age of the mother tree advanced beyond 10 y, seedling root length decreased (Table 1). The highest shoot

length was also recorded from seeds collected from the 10-y-old trees. Reduction in shoot length was observed when the age of the mother tree was below and above 10 y (Table 1). Seedling dry matter and vigour index were highest (93 mg and 2453) from seeds collected from the 20-y-old trees (Table 1 and Figure 1).

Table 1. Effect of age of neem mother trees on germination and seedling growth

Age (y)	Germination (%)	Days taken for seedling emergence	Root length (cm)	Shoot length (cm)	Dry matter production (mg)	Vigour index
5	68.4^{d} (55.79)	8.0^{ab}	11.8^{ab}	16.7^{ab}	81^{ab}	1955^{c}
10	76.0^{c} (60.68)	8.5^{ab}	12.4^{a}	16.2^{b}	59^{b}	2169^{b}
15	80.6^{b} (63.87)	9.5^{b}	11.2^{ab}	18.2^{a}	70^{ab}	2375^{ab}
20	88.2^{a} (69.91)	7.5^{a}	10.5^{ab}	17.3^{ab}	93^{a}	2453^{a}
25	60.8^{f} (51.24)	9.5^{ab}	9.6^{ab}	16.3^{b}	73^{ab}	1629^{d}
30	64.00^{e} (53.13)	9.5^{b}	9.1^{b}	17.2^{ab}	73^{ab}	1684^{d}

(Figure in parentheses indicate arc sine values).
Means followed by same letter(s) in a column are not significantly different by DMRT.

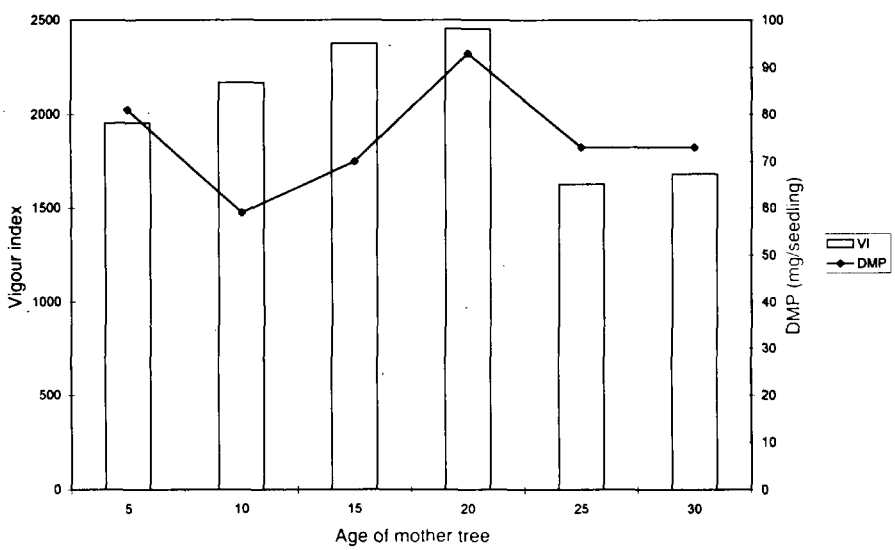

Figure 1. Effect of age of neem mother trees on dry matter production and vigour index

In the present study, seeds collected from the 20-y-old trees had the highest germination percentage, seedling dry matter and seedling vigour among the seeds from the trees of various ages. Olsen (1932) also reported that seeds from middle-aged pine trees produced

better germination and seedling growth. Similarly, an increase in germination and seedling vigour of seeds from middle-aged trees was also reported by Benzie (1960) for balsam fir and by Swaminathan *et al.* (1994) for *Ceiba pentandra*. Ramprasad and Kandya (1992) recommended that the seeds should be collected from mature or nearly mature trees. Over mature or immature trees should be avoided, since seeds from them may be of low viability. By pooling seeds with age groups we were able to assemble enough seeds for this experiment. However, we recognise that we have no measure of tree-to-tree variations, nor do we know whether seed quality varies with the location of the fruit on the tree. While our results suggest that tree age may significantly influence seed quality characteristics, we acknowledge that further study is needed.

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