

Effect of Tree Age and Diameter on Germination of Teak

Germination and seed parameters associated with seed depend upon seed set, source and age of tree species and site conditions. Large number of fruits are seedless even though they are tectra-locular fruit. It was found that on an average 43.4% fruits were seedless, followed by 24.7% one seeded, 15.1 two seeded and 0.5% four seeded. Germinative capacity and plant percent also varies (10 to 70%) within wide limits for seeds from different parts of India and Burma (Kadambi, 1993). A study in Burma revealed that germination capacity in teak was 40-50 and these seed can be dormant for 2-3 years. In an another study in Madras, germination of teak seeds was noticed to be depended on seed size. On the other hand, no difference in germinative capacity was found between large and small seeds (Kadambi, 1993).

Fruiting of *Dipterocarpus* was observed in all diameter classes from 10 cm dbh but proportion of fertile trees was maximum and stable only above 50 cm dbh which could be considered as a limit of maturity for dipteocarpus (Nguyen The and Sist, 1998).

Fertile seeds were produced at early age in UP, India. Germination tests made on the teak seeds from trees 4,8, 10,13,23 year old gave plant per cent 4,6,15,18, respectively. Coppice shoots also fruit very early. Seeds from 9 year old coppice in Sagar (M.P.) produced healthy seedling than old tree. Seeds from healthy, well formed trees provide greater assurance so that resulting stock will have good form, survival and resistance against stress conditions. Hence, the present study was undertaken to know the effect of age and dbh classes on teak germination.

An experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the effect of age and diameter classes of teak trees on seed germination during 2000-2001. The experiment consisted of 12 treatment combinations in the split-split plot design with three replication. Main

plot: Age of tree viz, 17 and 25 years, sub-plot: Type of plantation viz, block plantation and agroforestry system. Sub-sub plots : dbh classes of trees viz, 15-20, 20-25, 25-30 cm.

The teak trees were selected from two different agro climatic zones, i.e. transitional zone and hilly zone. In transitional zone, teak trees were raised as a major component in an agroforestry system and block plantation in red soils. While in hilly zone also, trees were raised as a main component in a sapota based agroforestry system and in block plantation in clayey soils.

Based on the diameter of tree species, ten phenotypically good trees were selected for the study. Special care was taken during the selection of trees for the tree characters like straightness, cylindrical, forking, non twisting bole, good growth, narrow crown, thin branches with wide branch angles and pest and disease free. Seeds were collected in Nov, 2000 from selected trees, mixed uniformly and 4 kg seeds were collected and seed parameters were studied. Seeds were subjected to alternate wetting and drying treated with dung slurry to soften hard seed coat and enhance the germination of seeds. Seeds were sown (50) in earthen pot having diameter of 40 cm and 16 cm height and filled with pot mixture of soil; sand ; FYM (2:1:1) during April 2001. Watering was done based on the requirements. Seedlings were uprooted after six months. Observation on seedling characters like leaf, shoot and root weight was recorded.

The result indicated that teak seed weight and diameter were not influenced by age of the trees. Seed weight was higher in 17 year teak trees as compared to 25 year aged trees. Germination was significantly higher in 25 year aged trees (26.27%) as compared to 17 year tree (20.63%). Root and total dry weight of seedlings were significantly higher in 25 year aged trees (35.41, 69.09 g/tree, respectively) as compared to the 17 year tree (30.15 and 64.84,

respectively). However, shoot and leaf weight of the seedling were not influenced by age of trees. The fertility of the seeds increased with increase in age from 15 years on words up to 40 years (kadambi,1993). As the age of mother tree exercises a profound influenced seed vigour, quality and early growth of seedling in casuarina (Maideen *et al.*, 1997).

Weight of 100 seeds (70.28 g) was significantly higher in seeds collected from trees grown in agroforestry system as compared to those from block plantation (55.39 g/100 seeds). Similarly germination of seeds was significantly

higher in seeds collected from tree grown in agroforestry system (25.67%) as compared to the seeds from block plantation (21.28%). Leaf, shoot and root dry weight of seedling were significantly higher in the seeds collected from trees in agroforestry system as compared to the those from block plantation. Total weight of the seedlings was significantly higher in the seeds from agroforestry system as compared to block plantation. This may be due to the reason that the trees grown in agroforestry system have higher availability of growth resources, wider canopy and produced more carboydrate which resulted higher production of fertile seeds. The vigour of isolated

Table 1. Seed weight, seed diameter and germination of teak seeds as influenced by different treatments

Typer of Planting (P)	100-Seed weight(g)			Seed diameter (cm)			Seed germination (%)		
	Age of the tree (A)			Age of the tree (A)			Age of the tree (A)		
	17 years	25 years	Mean	17 years	25 years	Mean	17 years	25 years	Mean
Pn TDC 1	37.27	41.67	39.47	0.79	0.84	0.82	14.00	12.00	13.00
2	54.00	61.33	57.67	0.92	1.15	1.04	18.00	27.92	22.98
3	67.30	70.80	69.05	1.11	1.31	1.21	23.77	31.97	27.87
Mean	52.86	57.93	55.39	0.94	1.10	1.02	18.59	23.98	21.28
AFS TDC1	45.47	41.27	43.37	0.75	0.83	0.79	10.00	24.23	17.12
2	71.07	68.83	69.95	1.14	1.05	1.09	24.00	27.10	25.55
3	104.53	90.53	97.53	1.36	1.34	1.35	34.00	34.37	34.18
Mean	73.69	66.88	70.28	1.08	1.08	1.08	22.67	28.57	25.62
TDC(c)1	41.37	41.47	41.42	0.77	0.84	0.80	12.00	18.12	15.06
2	62.53	65.08	63.81	1.03	1.10	1.07	21.00	27.53	24.27
3	85.92	80.67	83.29	1.24	1.33	1.28	28.88	33.17	31.03
Mean	63.27	62.41	-	1.01	1.09	-	20.63	26.27	-
	Sem $\pm$	CD(0.05)		Sem $\pm$	CD(0.05)		Sem $\pm$	CD(0.05)	
A	0.94	NS		0.018	NS		0.28	1.70	
P	0.54	2.12		0.019	NS		0.50	1.96	
C	0.53	1.58		0.015	0.044		0.46	NS	
AP	0.76	2.27		0.028	0.084		0.71	2.12	
AC	0.75	2.24		0.021	0.063		0.65	NS	
PC	0.75	2.24		0.021	0.063		0.65	1.94	
APC	1.06	3.17		0.030	0.089		0.95	2.84	

Note: A- Age of the tree (17 and 25 years); P-Typer of planting ; Pn- Plantation, AFS- Agroforestry system ; C=TDC=Tree diameter classes - 1.15 - 20 ; 2. 20-25; 3.25 30 cm.

Table 2. Leaf, root, shoot and total weight of teak seedlings as influenced by different treatments

Type of Planting (P)	Leaf weight(g/pl)			Root weight (cm)			Shoot weight (g/pl)			Total Dry weight(g/pl)		
	Age of the tree (A)			Age of the tree (A)			Age of the tree (A)			Age of the tree(A)		
	17 years	25 years	Mean	17 years	25 years	Mean	17 years	25 years	Mean	17 years	25 years	Mean
Pn TDC 1	5.11	7.86	6.49	19.64	24.29	21.97	11.51	10.76	11.13	36.26	42.92	39.59
2	10.27	14.27	12.28	25.46	35.08	30.27	18.29	16.55	17.42	54.02	65.91	59.97
3	20.61	16.43	18.52	37.52	44.02	40.77	24.41	20.98	22.69	82.53	81.43	81.98
Mean	11.99	12.86	12.43	27.54	34.47	31.00	18.07	16.09	17.08	57.60	63.42	60.51
AFS TDC1	10.60	10.57	10.58	25.33	28.58	26.95	14.38	15.91	15.15	50.31	55.05	52.68
2	17.65	20.79	19.22	32.17	37.25	34.71	22.49	20.76	21.62	72.31	78.80	75.56
3	25.08	22.81	23.95	40.76	43.22	41.99	27.79	24.42	26.11	93.63	90.45	92.04
Mean	17.78	18.06	17.92	32.75	36.35	34.55	21.55	20.36	20.95	72.08	74.77	73.43
TDC(c)1	7.86	9.22	8.54	22.48	26.44	24.46	12.95	13.34	13.14	43.28	48.99	46.14
2	13.96	17.54	15.75	28.82	36.16	32.49	20.39	18.65	19.52	63.19	72.36	67.76
3	22.84	19.62	21.23	39.14	43.62	41.38	26.10	22.70	24.40	88.08	85.94	87.01
Mean	14.89	15.49	-	30.15	35.41	-	19.81	18.23	-	64.84	69.09	-
A	Sem±	CD(0.05)		Sem±	CD(0.05)		Sem±	CD(0.05)		Sem±	CD(0.05)	
P	0.60	NS		0.28	1.70		0.07	0.42		0.34	2.06	
C	0.51	1.99		0.15	0.58		0.10	0.39		0.66	0.59	
AP	0.44	NS		0.16	0.48		0.11	NS		0.44	1.32	
AC	0.72	2.15		0.21	0.63		0.14	0.42		0.94	NS	
PC	0.62	1.85		0.22	0.66		0.15	0.49		0.62	1.85	
APC	0.62	NS		0.22	0.66		0.15	0.49		0.62	1.85	
APC	0.88	NS		0.32	0.97		0.21	0.63		0.88	2.63	

Note: A- Age of the tree (17 and 25 years); P- Typer of planting ; Pn- Plantation, AFS- Agroforestry system ; C=TDC= Tree diameter classes - 1.15 - 20 ; 2.20-25; 3.25 30 cm.

trees is more than block plantation. Seed filling may be improper in block plantation due to scarce availability of growth resources.

Tree growth has significant effect on seed size, germination and other parameters. The seed weight, seed diameter and germination increased significantly with increase in diameter class from 15-30 cm to 25-30 cm. Root and total dry weight of seedling were significantly higher in diameter class of 25-30 cm as compared to the 15-20 cm. Seed production generally depends upon the growth of trees. The better and healthy grown trees (25-30 cm diameter class) produced good seeds as compared to poor grown (15-20 cm) trees. This may be due to increased development of seeds in tree of higher diameter class. Similar results were observed in the *Dipterocarpus* by Nguyen The and Sist (1998). Yadav *et al.* (1995) reported that seed quality increased gradually with increase in girth of mother tree upto a certain age class of trees in *D. sissoo*.

Seed weight, seed diameter and germination were significantly higher in seeds collected from 25 year tree grown in agroforestry system followed by 17 year tree grown in agroforestry system as compared to both age tree grown in block plantation. Seedling parameter viz, shoot root, leaf and total weight

of seedling was higher in seed of both aged tree grown in agroforestry system as compared to both aged tree block plantation. This may be because tree in agroforestry have better resources for development of seeds as compared to block plantation.

Seeds from all diameter classes grown in agroforestry system have attained significantly higher seed weight, seed diameter germination and seedling parameter as compared to similar diameter classes of tree in block plantation.

Diameter class of 25-30 cm from trees of 17 and 25 year old has produced significantly higher seed diameter, seed weight and germination as compared to the 15-20 cm diameter class of both the ages. The seedling parameters viz, root, shoot and total dry weight were significantly higher in 25 -30 cm dbh class of both aged trees (17 and 25 years) as compared to the 15-20 cm diameter class.

The interaction effect of age of tree vs type of plantation vs diameter classes was significant in respect of seed diameter , seed weight, germination and seedling parameters. As plant growth and development is influenced by many environmental factors. In *Dalbergia sissoo* with its vast natural distribution and existing diversity due to ecological variation is expected to have considerable genetic variation (Sidhu, 1997).

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