JOURNAL OF CRITICAL REVIEWS

ISSN-2394-5125 VOL 07, ISSUE 18, 2020

SELECTION INTENSITY AND DIFFERENTIAL IN *TECTONA GRANDIS* Linn.

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Abstract

A study in 10 years old Teak plantation was conducted and results showed that selection differential and selection intensity for height were recorded 2.40 m. and 13.18 percent, respectively while for diameter at breast height estimates for selection differential and intensity were recorded 5.06 cm. and 10.09 percent, respectively. Simultaneous selection for height and diameter both at culling showed the values 2.66 m. for height and 5.26 cm for diameter as selection differential and 3.81 percent as selection intensity.

Introduction

Teak is a unique species which produces most aristocrat tree species. Although Teak is not indigenous but it is spread over large part of India and a lot of variation is present. Therefore, there is plenty of scope to improve Teak through selection and hybridization. Variability studies are important wherever selection forms the basis of genetic improvement. Selection of plus trees from available population is the first step in initiating a breeding programme in forest trees. Selections are based on the phenotypic characters. Phenotype is the result of Genotype and the Environment. In a natural forest the trees may be widely spaced and large number of individuals can be selected.

In a plantation area where trees are related in one sense that they come from the same seed source, therefore minimum number of individuals should be selected from a plantation area (Kumar, 1995).

Several selection methods are available to the tree breeder, which depend upon the types of genetic variations in the population, whether pedigree information exists, and the degree of urgency in establishing production seed orchards. To make quick and inexpensive gains in a tree improvement programme, individual selection of tree is widely used and generally the most satisfactory among the several methods available (Zobel and Talbert, 1934).

Material and Methods

The present study was conducted on Teak species planted in 1993 at forest research nursery, Lalkuan. This site lies between $29^0$16'N latitude, $79^0$40'E longitude and 256m MSL altitude. Spacing between each plant was 2.5×2.5m. Analysis was done from data of height (m.) and diameter at breast height (cm.) recorded on 1100 individual trees. Other parameters as collar diameter, angle of branches, number of branches and crown diameter were also measured to select the best population. Marks were given to trees according to their disease, bending, leaning, buttress, fluting etc. Forked, Bend and Lean trees were not selected as plus trees.

Calculation of Selection intensity and selection differential was done by the method given by Sharma (1994). For selection differential, an arbitrary culling level, K was fixed for height (17.5 m) and diameter at breast height (17.5 cm) and trees beyond this level were selected.

Selection Intensity and Differential were calculated by using following formula:

$$\mathbf{I = n/N \times 100}$$

Where,

I = Selection Intensity (%)
N = Number of trees selected
N = Size of base population

$$\mathbf{S = x-\mu}$$

Where,

S = Selection Differential
X = mean of selected population
M = mean of original population

Results and Discussion

Selection of plus tree is the primary step in the development of tree improvement programme. In the present study plus trees of Teak were selected through comparison mean method, from plantation. This method is widely accepted in even-aged stands in the plantations of hardwoods (Zobel & Talbert, 1984). The selected plantation was on uniform site. Based on superiority in height (above 17.5 m.) and diameter (above 17.5 cm.) results are given in table 1.

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Plus tree numbers 36 (21m.) exhibited maximum height while tree number 859(22.6 cm) exhibited maximum diameter at breast height. Out of total 1100 trees 145 trees have been selected above the culling level (more than 17.5 m) for the height.

After analysis of the data, 111 trees were found above the culling level for diameter at breast height. The mean of height of selected trees were found to be 18.19 meter while the mean of original population was 15.79 meter. Selection Intensity and Selection Differential for height were calculated as 13.18 percent and 2.40 m. respectively. Mean of the diameter of selected population was19.38 cm. while the average of original population was14.32 cm.

Selection intensity for diameter at breast height was calculated as 10.09 percent, while Selection Differential resulted as 5.06 cm.

Data on plus tree selection based on superiority for both height (>17.5 m) and diameter at breast height (> 17.5 cm) simultaneously, are depicted in the Table 2.

Data suggested that 42 trees could be selected on the basis of joint culling level for height and diameter at breast height. Mean of trees selected based on both height and diameter was 18.45 m and 19.58 cm, respectively.

However, selection intensity was recorded as 3.81 percent in the case of simultaneous selection for both height and diameter (Table 3). Figure 1 shows selection superiority based on both the characters height and diameter, individually and in combination. Plus tree selections were aimed to increase the quality and quantity of seed production. To increase the efficiency of selection two major characters height and diameter were considered.

Table 1: Plus trees selected on the basis of Height and Diameter Culling level

Height		**Diameter**	
Plus Tree no.	**Height (m.)**	**Plus Tree no.**	**Diameter (cm.)**
1	**2**	**3**	**4**
5	19	2	22.5
12	19.1	5	18.4
19	18	12	18.2
21	17.5	69	20.3
22	18.5	87	17.5
29	17.5	99	22.8
34	18.5	125	18.4
36	21	126	18.3
37	19	131	20.9
39	19.25	140	19
40	18.5	144	19.8
42	19	153	18.1
44	18.25	157	19.1
47	17.75	168	20.8
52	19.25	183	18.2
53	18.5	188	20.1
55	18.75	197	23.5
56	17.5	198	17.8
59	18.25	200	21.6
69	20.5	201	19.8
78	19	203	23.1
79	18	204	19
80	19	206	17.7
83	17.5	221	17.5
84	18	237	22.5
90	17.75	240	20.4
99	18.25	258	19
115	17.5	275	19.6
125	18.4	301	20
129	18.9	309	17.7
130	19.1	313	20.4
131	19.8	315	19.6

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132	18.1	323	17.6
133	17.8	339	18.1
136	17.6	367	20.2
138	17.9	373	18
140	19.1	375	20.4
142	18.4	380	17.7
143	19.2	396	18
144	20.4	407	17.7
148	19.8	438	18
153	19.4	452	22.8
167	17.5	470	19.8
188	17.5	471	17.9
197	17.8	489	19.5
198	17.5	516	18.5
200	18.4	536	21.9
201	18.75	557	19.3
204	17.5	567	19.9
207	17.5	582	20.6
208	18.25	584	20
211	19.5	591	20.3
213	18.75	597	24.6
215	19	599	19.6
219	18.25	601	19.8
220	19.5	603	20.7
221	19.75	607	21.9
223	17.8	615	19.3
224	17.5	625	22.2
227	17.6	630	18.3
237	18.5	640	18.1
247	17.5	650	20.7
248	17.6	651	17.5
253	18	656	21.1
268	18	675	21.2
275	18	685	17.9
313	17.5	690	18
315	18.25	691	22.2
319	17.5	695	18.2
320	17.5	700	20.2
323	18.25	704	18.4
326	17.75	715	20.4
327	18	718	18.3
333	17.5	720	17.8
334	18	727	18.4
339	17.5	743	19.4
342	18.5	751	19.2
344	17.75	766	17.6
346	18.25	793	17.9
367	18.25	819	19.5
373	18.25	831	17.8
375	20	844	18
380	20.1	853	18.3
381	19.25	856	20.7

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386	17.5	858	17.7
391	17.5	859	22.6
407	17.5	871	19.4
417	18.5	880	18.9
424	18	891	19.8
425	18.25	900	19
438	17.75	903	18.2
440	17.5	907	19.2
442	18.25	911	18.2
452	17.75	927	18
456	18.25	976	17.8
462	18	980	18.9
464	18.25	987	17.9
467	17.5	1003	17.9
468	17.75	1007	19.2
470	18.25	1015	20.9
471	18.5	1028	21.9
478	17.75	1030	17.1
479	17.6	1039	18.3
536	19.75	1043	18
538	19	1052	17.7
539	18.5	1057	19.5
540	18.75	1061	19.2
541	18	1066	18.5
544	17.5	1069	17.6
545	17.5	1074	17.6
547	17.75	1091	21.3
550	18		
584	18		
589	18		
591	18		
626	17.5		
636	17.5		
637	17.5		
638	17.5		
675	17.75		
685	17.5		
743	17.5		
745	17.5		
746	17.5		
751	18		
767	17.5		
786	17.5		
795	17.5		
797	17.5		
911	17.5		
913	17.5		
917	17.5		
920	17.5		
922	17.5		
923	18.25		
927	18		

932	18.5		
940	18		
941	18		
943	17.5		
945	17.75		
1028	18.25		
1034	17.5		
1061	19.5		
1085	17.5		

Table 2: Trees Selected on the combination basis of height and diameter at breast height superiority.

Tree no.	Height (m.)	Diameter (cm.)
5	19	18.4
12	19.1	18.2
69	20.5	20.3
99	18.25	22.8
125	18.4	18.4
131	19.8	20.9
140	19.1	19
144	20.4	19.8
153	19.4	18.1
188	17.5	20.1
197	17.8	23.5
198	17.5	17.8
200	18.4	21.6
201	18.75	19.8
204	17.5	19
221	19.75	17.5
237	18.5	22.5
275	18	19.6
313	17.5	20.4
315	18.25	19.6
323	18.25	17.6
339	17.5	18.1
367	18.25	20.2
373	18.25	18
375	20	20.4
380	20.1	17.7
407	17.5	17.7
438	17.75	18
452	17.75	22.8
470	18.25	19.8
471	18.5	17.9
536	19.75	21.9
584	18	20
591	18	20.3
675	17.75	21.2
685	17.5	17.9

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743	17.5	19.4
751	18	19.2
911	17.5	18.2
927	18	18
1028	18.25	21.9
1061	19.5	19.2

Table 3: Estimates of selection intensity and differential in Teak plantation

Parameters	Selection based on culling level for			
	Height	Diameter	Combined selection	
			Height	Diameter
Size of base population	1100	1100	1100	1100
Size of population selected	145	111	42	42
Mean of base population	15.79	14.32	15.79	14.32
Mean of selected population	18.19	19.38	18.45	19.58
Selection Intensity (%)	13.18	10.09	3.81	3.81
Selection Differential	2.40	5.06	2.66	5.26

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